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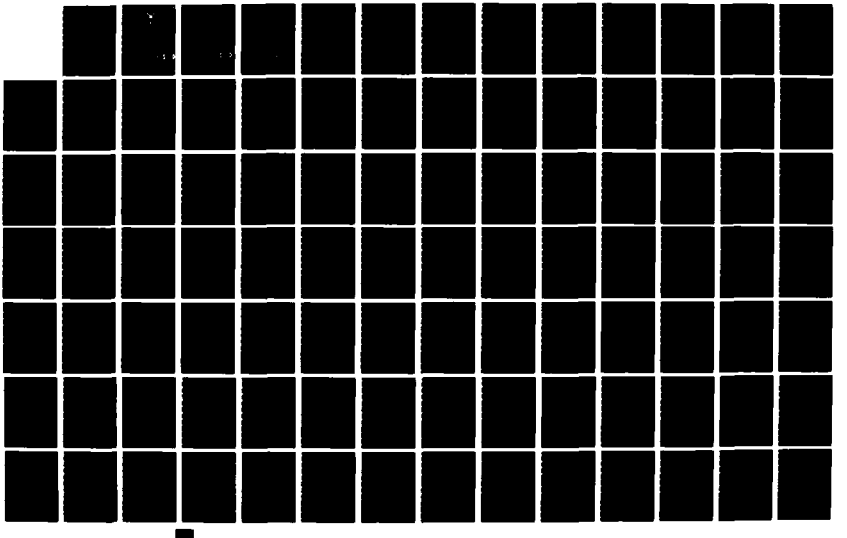

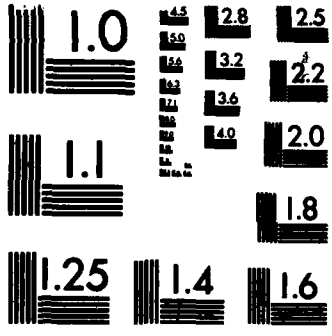

THE INFLUENCE OF QUALITY CIRCLES ON ATTITUDINAL OUTCOMES AMONG CIVIL ENGINEERING PERSONNEL

THESIS

Alfred E. Thal, Jr.
First Lieutenant, USAF

AFIT/GEM/LSB/85S-21

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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AFIT/GEM/LSB/85S-21

THE INFLUENCE OF QUALITY CIRCLES ON [redacted] ATTITUDINAL OUTCOMES AMONG CIVIL ENGINEERING PERSONNEL

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Engineering Management

Alfred E. Thal, Jr., MS
First Lieutenant, USAF

September 1985

Acknowledgements

There are three people without whom I couldn't have completed this research. First, I want to thank my advisor, Dr. Robert P. Steel. Thanks for lettting me do it my way, but keeping a tight enough rein on me to ensure I completed the task at hand.

Most of all, I want to thank my wife, Susan Lynn, and my beautiful new daughter, Jennifer Marie. My wife had a rougher 15 months than I did; but it was her never-ending support and positive attitude that got me through the past year. My baby daughter gave me the incentive to keep on going when the going got rough. I love them both more than they'll ever know.

Alfred E. Thal, Jr.

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Abstract

With the federal budget continually attracting attention and the social values of its members constantly changing, the Department of Defense is showing greater interest in Quality Circles (QCs) as a way of better accomplishing its mission. Costs of government-wide QC programs have exceeded five million dollars however. Therefore, Air Force managers need to be able to evaluate the effects of QCs in order to justify these costs.

This research investigated the influence of QCs on various satisfaction levels among Air Force civil engineering personnel with the objective being to determine whether a relatiohship exists between QC membership and an employee's level of satisfaction/morale. Surveys were mailed to a sample of QC members and non-members working in civil engineering squadrons at five different bases. Statistical analysis consisted of reliability estimation, Pearson correlation, and Student's t-tests.

The results of this research indicated that there were significant differences between QC members and non-members on two variables: self-ratings of both job performance and job effort. In fact, it appeared that QC members scored lower, but not significantly lower, on many of the variables.

The many weaknesses inherent in this study's design suggest that these results are tentative, at best. Four tenable explanations for the results are given. If QCs are to be increasingly used by the government, further research into the outcomes of the QC process are warranted.

THE INFLUENCE OF QUALITY CIRCLES ON VARIOUS ATTITUDINAL OUTCOMES AMONG CIVIL ENGINEERING PERSONNEL

I. Introduction

Two of the most important priorities facing the Department of Defense in the 1980s are a concern for its people and a concern for productivity. With the federal budget receiving increasing amounts of attention, it is imperative that those of us in the public sector, including the military, realize that the government does not have an endless supply of money to spend. The only way to face this limited budget without reducing our ability to accomplish the mission is to become more productive. We must learn to spend the taxpayers' money as effectively as possible without compromising national defense. Increasing productivity however, should not occur at the expense of the work force. This dual concern for both people and productivity has resulted in the development of various strategies designed to collectively improve productivity, product quality, and employee attitudes (Atwater & Sander, 1984). One such strategy is a process known as Quality Circles.

A Quality Circle is a small group of employees trained to identify and solve problems in their immediate work areas. The Quality Circle (QC) concept involves a partici-

pative management approach to productivity improvement through more involvement of the work force in the decision making process (Lloyd & Rehg, 1983). The objective of this management technique is threefold: it attempts to improve productivity, product quality, and employee motivation (Dewar, 1980).

Productivity

Concern for the rate of productivity growth in the United States is rapidly rising. From 1965 to 1982, the rate of productivity growth has steadily declined, and productivity itself has shown no growth whatsoever since 1977 (Donnelly, Gibson, & Ivancevich, 1984). From 1950 to 1980, however, Japan's annual productivity growth rate has been four times that of the United States. As of 1980, our productivity growth was the lowest of all industrialized nations. Furthermore, if these productivity trends continue, American workers' productivity will not only lag behind Japanese workers by 1990, but also behind workers in Canada, West Germany, and France (Gottschalk, 1983).

In response to our steady decline in productivity growth, the United States Chamber of Commerce commissioned the Gallup organization to poll American workers on their attitudes towards productivity. The results of their survey showed that "workers express a willingness to work together with management" to improve productivity (Barra, 1983:28). A majority of the workers also felt that the most improve-

ment would be gained by changing workers' attitudes and abilities (Barra, 1983). The U.S. Chamber of Commerce conducted another study in 1981, but this time they polled top management on their productivity attitudes. In this study, they discovered that upper management personnel believed that their employees were genuinely concerned with quality (Barra, 1983).

The Work in America Institute added to this increased interest in productivity. In 1980, they held a symposium in which executive-level personnel from all across the country expressed their thoughts on productivity. The most important conclusions they reached are as follows (Barra, 1983:44-45).

1. The commitment to improve the work environment and improve productivity must start at the top of work organizations and must be reinforced by concrete strategic programs that provide guidance and incentives for middle- and lower-level management to take risks.

2. Management should recognize that productivity is the result of overall organizational effectiveness. Too often productivity problems are blamed on the failings of employees when other factors are responsible.

3. Productivity improvement should be an ongoing process rather than a remedial measure applied in a period of crisis. Top management should develop long-range productivity improvement efforts rather than concentrate only on short-term goals.

4. It is the responsibility of top management to create an environment that promotes productivity growth through the improved involvement of people.

These surveys lead to the conclusion that management, as well as the workers themselves, believe that the majority of American workers are actually concerned about the productivity of their companies. The workers' beliefs go one step further, however; they believe that they can contribute to productivity improvement themselves. Considering this conclusion and the idea that the QC concept leads to productivity improvements through more involvement of the work force in the decision making process, it appears then that Quality Circles are tailor made for U.S. organizations in the 1980s.

As mentioned earlier, however, productivity improvements should not come about at the expense of the work force. Any productivity improvement initiative should benefit both the organization and the employee. If workers perceive ideas for improving productivity as simply ways of making them work harder, or as possibly costing them their jobs, they will not support the ideas. Without this critical element of worker support, any attempts at improving productivity will be destined to fail.

Any major changes in productivity will require a drastic change in American management philosophy. Management's belief that their employees are genuinely concerned about the company's productivity will have to go one step further. Management must also hold the belief that their employees have the potential to contribute to productivity improvements given the opportunity to do so.

Using employees' potential, however, is not as easy as it would have been in previous years. The work force of the 1980s is very different from that of its predecessors as a result of changing social values and volatile economic conditions (Barra, 1983). Today's workers are much more interested in personal growth and self-fulfillment than yesterday's workers. They are better educated and have a better understanding of individual worth and selfhood (Barra, 1983). Workers of today have less confidence in management and do not trust them as much as they used to in the previous two decades (Lloyd & Rehg, 1983). The attitudes of today's workers toward their jobs and how they are managed are much more negative than they were 25 years ago (Metz, 1981). The "growing demands and expectations of better-educated people in the work force must be dealt with by a cooperative approach which develops mutual respect" between management and employees (Barra, 1983:xi).

These changes have also affected the way in which organizations view their people; the majority of organizations are beginning to feel that their most important resource is their people. This view, however, will require that these same organizations abandon their traditional management styles of "Taylorism" and instead adopt a more cooperative and trusting approach which emphasizes both people and productivity. Quality Circles represents an intervention into the organization itself which, for most

organizations, will cause a significant change in the assumptions management has made about its employees and how they are managed.

The management style of "Taylorism" is simply a system of separating the work of planning from the work of execution (Juran, 1980). Mintzberg suggests that one of the basic tenets of this system is that it is the manager's role to tell the workers what to do; and it is the workers' role to do exactly what they are told (Blair & Whitehead, 1984). According to Taylor, it was management's responsibility to (1) design the methods for doing work, (2) establish standards for a day's work, (3) establish ways of selecting and training workers, and (4) design incentives to motivate workers to use established methods and to meet the standards for a day's work (Juran, 1980). This system of division of work increased productivity tremendously during the first half of the twentieth century. In fact, "Taylorism" still remains as the foundation upon which many U.S. management styles are built. One of the major premises behind Taylor's division of work was that workers of that time were not educated enough to do any of the planning. If workers did possess the right amount of education, however, as they do now; Taylor felt that workers could play a significantly more active role in decision making and work planning. Taylor thus recognized the importance of the workers' contributions:

> Every encouragement ... should be given to him to suggest improvements, both in methods and in implements. And whenever a workman proposes an improvement, it should be the policy of the management to make a careful analysis of the new method, and if necessary conduct a series of experiments to determine accurately the relative merits of the new suggestion and of the old standard (Taylor, 1967:128).

There are two major assumptions underlying the QC approach. First, Quality Circles assume that the people actually doing the work are the best experts pertaining to that work (Blair & Whitehead, 1984; Wood, Hull, & Azumi, 1983). Quality Circles involve a shift from external control to internal control (Blair & Whitehead, 1984); they recognize that the people directly involved in the work have the greatest capacity for affecting quality and productivity. This is an important feature for QCs since Quinn and Staines found that a third of all workers surveyed in 1977 felt that their skills were underutilized (Wood et al., 1983). Thus, the impact of QCs on improving productivity in American organizations will depend to a large extent on the "latent skills possessed by employees and how much opportunity QCs provide for increasing the utilization of those skills" (Wood et al., 1983:46).

The second assumption underlying QCs is that the causes of poor quality or low levels of performance are not known (Juran, 1967; Blair & Whitehead, 1984). Thus, there is a need to analyze these problems and determine the causes of poor quality or low productivity. This analysis can be

accomplished by employees trained in proper problem solving techniques.

These two assumptions lead to the conclusion that the QC concept involves a significant amount of participative decision making on matters that management has previously considered their sole responsibility (Juran, 1980). This represents a transformation from the traditional "top-down" management style to a more participative "bottom-up" style. Pascale and Athos suggest that the widespread and long term success of QCs will require a commitment on management's part to greater responsiveness to workers' needs and to a reconsideration of workers' capabilities and of the value they place on workers' participation (Blair & Whitehead, 1984).

Problem Statement

The Air Force consists of a cross-section of people from across this country. Therefore, one may assume that productivity issues and remedies suitable for the private sector also pertain to public sector organizations. With the federal budget continually attracting attention and the social values of its members constantly changing, the Department of Defense (DoD) is showing greater interest in Quality Circles as a better way of accomplishing its mission.

This research proposes to investigate the influence of Quality Circles on various satisfaction levels of partici-

pants from Air Force civil engineering organizations. The principle intent of this research is to assess whether a relationship exists between membership in a civil engineering Quality Circle and levels of employee satisfaction and morale.

II. Literature Review

Introduction

A more precise definition than that previously given for Quality Circles is necessary before the literature on the subject is reviewed. Although many definitions exist in the field concerning QCs, they all state essentially the same thing. The following description by Thompson, however, depicts QCs very effectively.

> A Quality Circle is a small group of employees and their supervisors from the same work area, who voluntarily meet on a regular basis to study quality control and productivity improvement techniques, to apply these techniques to identify and solve work related problems, to present their solutions to management for approval, and to monitor the implementation of these solutions to ensure that they work (Thompson, 1982:3).

To provide a clear understanding of the concepts and consequences of Quality Circle membership, general information is provided in this chapter. The remainder of this chapter is divided into four sections. The first section reviews the various literature in the field dealing with Quality Circles. This is followed by a brief discussion of three motivational theories to possibly explain why QCs work. The third section reviews previous research done in the Quality Circles area. Of particular importance to this research is the two studies involving civil engineering organizations. Finally, the last section of this chapter develops the hypotheses used for this research.

Background

This background section is divided further into four subsections. The first subsection examines the history of Quality Circles as they developed and matured in Japan. This is followed by a discussion of QC applications in the United States. The third subsection discusses the various benefits that are purported to result from the use of QCs. Finally, the last subsection will describe the operation of QCs in a typical American company.

History and Early Development. The history of Quality Circles begins in Japan where they were first introduced in 1962. To gain a true understanding of their development though, one must go back to World War II (WWII) and the postwar era. During this period, anything "Made in Japan" was considered nothing more than junk (Gryna, 1981). As a consequence of their devastating defeat during WWII, Japan realized that the road to recovery depended upon their economy. In order to survive financially and economically, they would have to develop the capability of exporting high quality products (Barra, 1983). To develop this capability, the Japanese Union of Scientists and Engineers (JUSE) felt that the basic ingredient necessary to accomplish this recovery was statistical quality control.

During this postwar period, many Japanese industrial leaders placed every confidence in the assumption that American management techniques were far superior to any

other techniques espoused at that time (Cole, 1980a). It was at this time that American management styles and theories were first introduced to Japanese businesses. One of the first theories the Japanese implemented was that of quality control. The quality control programs thus introduced were implemented with the help of two Americans: Dr. W. Edwards Deming and Dr. Joseph M. Juran.

In 1949, at the suggestion of the United States, the Japanese Union of Scientists and Engineers (JUSE) invited Dr. Deming to talk to their industrial leaders about quality control (Lloyd & Rehg, 1983). Dr. Deming was reluctant at first because of his perception that his talks on quality control fell on deaf ears in the United States (Deming, 1980). American management at that time understood the economic importance of quality control; however, they did not understand that in order for quality control to succeed, management must take an active role in supporting it. Deming finally accepted the offer to talk to the Japanese, and he told them that they could "invade the markets of the world and have manufacturers screaming for protection in five years" if they would commit themselves to quality control (Deming, 1980:40). Deming further explained to these industrial leaders various statistical methods to pinpoint special causes of quality variations. These Japanese leaders enthusiastically accepted Deming's ideas and asked him to conduct various courses and seminars on the subject of quality control.

Dr. Deming thus began teaching statistical methods to Japanese engineers in 1950. The subjects he covered were controlled and uncontrolled variability, control charts, and sampling inspections. In his lectures, Deming stated:

> Statistical Quality Control is the application of statistical principles and techniques in all stages of production directed toward the most economic manufacture of a product that is maximally useful and has a market (Crawford, 1983:4).

After their engineers had gained a good understanding of quality control, the JUSE decided it was time to get management involved. In 1954, Dr. Juran was invited to Japan to speak on the managerial aspects of quality control. Dr. Juran stressed the importance of combining a quality control system with the overall management style; quality control must be an integral part of the management function and practiced throughout the organization (Cole, 1980a). Japan subsequently developed its own concept of quality control which called for everyone in the organization, from top management to rank-and-file workers, to understand and use statistical methods of quality control (Lloyd & Rehg, 1983). "Each worker, in concert with his or her workmates, is expected to take responsibility for solving quality problems" (Cole, 1980a:25).

During the 1950s and 1960s, quality control was "sold" through various publications and radio and television series. The goal of the Japanese government was to make quality a national objective (Wood et al., 1983). Japan was

no longer content with simply training management in the basics of quality control; they felt it was time to get the workers involved. Afterall, a manager's abilities to use his or her training depended on finding a way to utilize the human resources around him or her (Juran, 1967). To this end, the JUSE sponsored a new magazine in 1962 called "Quality Control for Foremen." In an editorial in the first edition, the JUSE called for the formation of Quality Control Circles to utilize the human resources at hand. These circles were called "Jishu Kanri," which translates roughly into autonomous self-management, and they were encouraged to use their new problem solving skills to help solve company problems. The circle concept was thus formed and included problem selection, analysis, and solution. Three QCs were formed in Japan in 1962; as of 1981, Matsuda claimed there were over 125,000 with a total membership exceeding one million (Wood et al., 1983).

There are three significant characteristics of QC Circles as they developed in Japan (Cole, 1980a:24):

1. The QC Circle is not a response to any specific problem; it operates continuously looking for problems to solve.

2. The QC Circle begins with the assumption that analysis is necessary to discover the causes and remedies for poor quality performance. To do this, circle members must be provided with the necessary tools and training to solve such problems.

3. Even if the circle's solutions are no better than those of management's, the workers will enthusiastically implement solutions they themselves have worked on.

During the 1950s, Japan's productivity level and reputation for product quality grew tremendously; their products were no longer considered junk. Dr. Deming claims that four forces contributed to this rapid change: the strong leadership of the JUSE, the increased knowledge of statistical methods, the instruction of engineers in quality control, and the understanding gained by top management (Lloyd & Rehg, 1983). Quality Circles in Japan have been very successful. Juran (1980) claims they have saved billions of dollars, improved worker motivation by providing a source of job interest not present in day to day work, and provided workers with a sense of participation in planning and decision making.

Simply because they have been very successful in Japan however, QCs should not be blindly adopted in this country as a cure-all for all productivity problems. The idea that Quality Circles are the best program for improving productivity in this country is partly based on the widespread misbelief that Japan owes all of its success to circles. This is not the case, however; there are several erroneous assumptions frequently made about the role of QCs in Japan's success which contribute to this misunderstanding (Wood et al., 1983).

To begin with, and contrary to popular belief, many Japanese firms do not use Quality Circles. A 1977 survey by the Japan Ministry of Labor showed that QCs are primarily

used by large firms; less than one-third of the Japanese companies with 100 to 299 employees used QCs. Secondly, most Japanese QCs are only a small part of a comprehensive Quality of Work Life program. In these companies, circles are maintained regardless of how little they accomplish. Finally, the Japanese companies most likely to possess QCs are also the companies in dominant market positions. This large market share gives these companies the flexibility to provide many extra benefits such as Quality Circles to their employees. In fact, Cole suggests that the success of QCs may be overly exaggerated by many.

> Even in those plants recognized as having the best operating programs, management knows that perhaps only one-third of the circles are working well, with another third borderline and one-third simply making no contribution at all (Cole, 1980b:30).

QC Applications in the U.S. The West first learned of Japan's success with QCs in 1967 from Dr. Juran. After visiting Japan and being impressed with what QC Circles had contributed to their product quality, Juran wrote "The QC Circle Phenomenon," in which he described his feelings and predictions regarding Quality Circles. His closing comments in this article express how strongly he believes in the QC concept:

> In my observation, no other nation is so completely unified on the importance of good quality achievement, so eager to discover and adopt the best practices being followed in other countries, so avid in training all company levels and functions in modern methods of controlling quality, so vigilant in regulating the quality of exported goods.... The conclusion is inescapable: the Japanese are headed for world quality leadership, and will attain it in the next two decades because no one else is moving there at the same pace (Juran, 1967:336).

Despite these strong statements, however, it was not until 1974 that the first Quality Circle program was begun in the United States. There are two commonly used explanations for this delay. First, top management in this country felt that Japanese customs and the Japanese work environment were a major factor in determining their success with QCs, and that the U.S. business environment and American customs lacked similar characteristics. The second typical reason given for the delay was the widespread feeling in this country that the Japanese were more noted for their ability to imitate than for their ability to innovate (Dewar, 1980).

The industry composition of early QC users in the U.S. consisted primarily of large quality conscious corporations, such as the aerospace and defense industries, and in companies already experiencing productivity problems, such as the automobile industry. These industries were the initial innovators of QCs because of their paramount desire to raise productivity and improve product quality; they were also among the first American companies to recognize

the underutilized potential of American workers as organizational resources (Cole, 1980a). In the past few years, however, the number and diversity of companies implementing QCs has grown dramatically. Because of this rapid explosion in QC use; Wood, Hull, and Azumi (1983) suggest that Quality Circles may become the managerial fad of the 1980s.

Quality Circles first appeared in the United States when Lockheed Missile and Space Company implemented them in 1974. The Lockheed experience is regarded by many as the greatest influence on the development of QCs in this country (Gibson, 1982). The government received its first introduction to QCs in 1975 when Rehg visited Japan and studied their programs. He returned to the U.S. and began teaching QC concepts and helping many government organizations start their own QC processes. However, interest in QCs faded until 1977 at which time five more companies started their own programs. It was also in 1977 when interest was fueled by the establishment of the International Association of Quality Circles. Since 1977, the interest in QCs has steadily grown. According to Gibson (1982), there were approximately 1,500 organizations in the United States with some form of QC program in 1982. Barra (1983), however, claimed that there were about 25,000 circles in 2,500 different organizations. By 1979, the Air Force had over 100 active circles and the Navy was beginning various programs of their own. As of January 1983, Crawford (1983)

found that QC programs within the government involved at least 139 separate locations and over 15,000 federal employees. In any case, QCs are attracting an increasing amount of attention and are growing very rapidly.

Quality Circles are not a cure-all, however; all QCs do not succeed. Ambler and Overholt (1982) have stated that while many U.S. companies do have successful QC programs, many others have very unsuccessful ones. They claim that over half of these unsuccessful circles have failed outright, many have been canceled, and many others have simply faded away (Ambler & Overholt, 1982). It seems as though many companies follow all the recommended procedures when implementing their QC programs, yet their circles do not contribute very much to solving the company's productivity problems. To avoid unsuccessful circles such as these, many authors have stressed the point that "recommended" procedures must be tailored to fit each individual organization (Ambler & Overholt, 1982; Wood et al., 1983; Cole, 1980a). Additionally, management needs to recognize that Quality Circles are not going to perform well in all organizations; they will perform well only in those organizations where the environment is similar to that of Japanese companies (Ambler & Overholt, 1982).

It is interesting to note the practices of Japanese companies with U.S. subsidiaries (Cole, 1980a). Two large Japanese firms with very successful QC programs have had

difficulty establishing a circle program in their U.S. subsidiaries; their efforts have been greatly resisted by the American managers. Many Japanese firms with successful QC programs in Japan have not even attempted to implement a circle program in their U.S. companies. They seem to doubt "whether American employees [have] sufficient organizational commitment to make the QC concept work in America" (Cole, 1980a:28).

Just as the Japanese adapted our management ideas to fit their conditions, American companies must adapt the idea of Quality Circles to meet conditions here. The emphasis of QCs in Japan is identifying and solving work related problems. In the U.S., however, QCs place a greater emphasis on group dynamics, human relations, and interpersonal communications (Wood et al., 1983). Wood, Hull, and Azumi (1983) have identified two major modifications to Japanese QCs in order to meet American needs: meeting on company time instead of after hours and creating the role of facilitator to implement and maintain the QC program.

The fact that Japanese QCs need to be adapted to American conditions is best represented by the name "Quality Circles" itself. In Japan, circles are called Quality Control Circles. In the U.S., however, the word "control" has coercive overtones that do not sit very well with many workers and unions. To avoid this, most American firms use less emotionally-loaded names such as Quality Circles or

Employee Participation Circles. Two of the major adaptations that need to be considered involve the union and monetary incentives.

American unions will resist the introduction of Quality Circles if they see it as just another way of getting increased productivity out of the workers without sharing any of the savings realized from the use of QCs. Unions may also feel that a QC program is an attempt at luring the loyalty of the workers away from the union. In any case, a union has many methods it can use to resist a QC program. To prevent this, a QC program must be seen as a management program, an employee program, and a union program (Cole, 1980b). In other words, the union must be involved from the very beginning of the QC process if the program is to have any chance of success.

Japanese QCs usually do not offer monetary incentives. Many American workers, however, feel that if they are going to put forth the extra effort to help the company solve productivity problems they should also have a share in any savings that result. Monetary incentives may not be necessary in all organizations, but they definitely "must play a larger role in American industry if circle activity is to be sustained" for any great length of time (Cole, 1980b:31).

Taking these adaptations into consideration, Cole (1980a:40-41) has identified six basic principles of Quality Circles that are necessary for circles to succeed.

1. Trust your employees to implement organizational goals if given a chance.

2. Build employee loyalty to the company.

3. Invest in training and treat employees as economic resources which have the potential to yield economic returns. The aim here is for long-term employee commitment to the company.

4. Recognize employee accomplishments to show them that you care about them as people and not just employees.

5. Decentralize decision making to enable the people with first-hand knowledge to make the decisions.

6. Work should be seen as a cooperative effort by both workers and management with the aim of doing the work together.

Although these principles may not seem very profound to American managers, "it is the ability of the Japanese to synthesize these principles in a system and institutionalize them in daily practice" that is fascinating (Cole, 1980a:41). Even if Quality Circles are a fad, and they fail to establish themselves in the United States, "If one could say that their major contribution was to convince American management that hourly-rated workers do have an important contribution to make to the organization and are prepared to do so when given the opportunity, then the innovation will have had a lasting impact in America" (Cole, 1980a:42).

QC Benefits. The purported benefits of Quality Circles fall into two broad categories: changes in productivity and quality of product or services and changes in

Quality of Work Life (Blair & Whitehead, 1984). A list of claimed benefits would include cost savings, increased productivity, development of leadership abilities by employees, reduction in conflict and improved communications between management and employees, improvement of worker morale and motivation, skill development among workers, stimulation of team work, and recognition of worker achievements (Cole, 1980a; Wood et al., 1983). Blair and Hurwitz (1981) state that QCs will lead to significant cost savings or major productivity improvements only infrequently. They suggest that QCs "are unlikely to do more than make minor improvements or may even do no more than improve group dynamics of the work group or improve job satisfaction without improving productivity" (Blair & Hurwitz, 1981:48). Mento (1982) claims that while there are many testimonials and some solid evidence that improved product quality, higher productivity, and reduced conflict may result from the use of QCs; there is very little hard evidence in support of increased morale and satisfaction. Cole believes that while QCs are not a panacea for solving all organizational problems, they do recognize the importance of the workers' contributions:

> They do provide a vehicle for unlocking the potential for worker contribution to the organization. The circles are also a vehicle for allowing workers a sense of dignity, a sense of fuller participation in the organization, and an opportunity to develop their skills (Cole, 1980b:30).

Most of the evidence in support of the first category of benefits, changes in either productivity or product quality, is in the form of "self-reported success stories or noted cases" (Wood et al., 1983:43). Lockheed estimated that QCs saved them three million dollars in 1977; the cost-benefit ratio was six to one and the number of defects caused by the manufacturing process dropped 67 percent (Blair & Hurwitz, 1981). The Norfolk Naval Shipyard claimed savings of $3.41 for every dollar invested in their Quality Circles. These figures were calculated from time savings, however; actual changes in work output were not measured (Blair & Hurwitz, 1981). Such savings are not very common though; Wood, Hull, and Azumi (1983) discovered from various surveys that only 30 percent of the companies surveyed had a savings to cost ratio of more than one. They suggest that this lack of savings, along with a decreasing number of QCs by early innovators such as Lockheed, represent indications of a diminishing rate of return for Quality Circles.

As mentioned before, there is little evidence in support of the second category of benefits: changes in Quality of Work Life. These nonmonetary benefits are being reported by some organizations however. Dewar (1980) claims that every organization using Quality Circles he has studied has reported an increase in employee morale. Hunt (1981) claims better morale and motivation, a growth in

team spirit, and less adversarial relations between management and employees resulted from the use of QCs. Studies by Tortorich, Thompson, Orfan, Layfield, Dreyfus, and Kelly (1981) suggest that QC participation results in improved employee attitudes about themselves, their co-workers, their supervisors, and their opportunities for personal growth and development. Employees' attitudes towards internal motivation and job satisfaction also showed improvement. Buback (1983) has observed a number of positive outcomes as a result of QCs. These observations, as reported by circle leaders, management, and the facilitator; include improved employee morale and motivation, improved job satisfaction of QC members, and development of team cohesiveness (Buback, 1983). Steel, Mento, Dilla, Ovalle, and Lloyd (1985) reported significant intervention effects of QCs on various measures in a military organization. These results are discussed in more detail later.

The theoretical basis for these intangible benefits is only briefly mentioned at this time; a more detailed discussion is found later in this chapter. The areas to be discussed here are based on organizational psychology literature which suggests that Americans like to identify themselves with a work group and conform to the group's performance norms; Americans also like to have input into decisions which affect them, to receive feedback on their performance, and to be recognized by management (Roll & Roll, 1983).

Quality Circles meet these needs described above; in fact, Blair and Whitehead (1984) state that the characteristics of QCs are very similar to those of effective small groups. QCs emphasize the idea that the group's goals must coincide with the organization's goals; QCs begin with goals or performance norms which are strengthened by the QC process itself; and group cohesion is encouraged through team-building exercises. Mento thinks this group interaction is one of the most important outcomes of the QC process (Steel et al., 1985). Roll and Roll (1983) found that many studies have indicated a relationship between group membership and productivity. Studies by Asch have shown that group membership helps reduce feelings of insecurity, anxiety, and powerlessness (Roll & Roll, 1983). Thus, Mayo suggests that group membership fills many of the psychological needs of most individuals (Roll & Roll, 1983).

Since Quality Circles are a participative management approach, this aspect of QCs deserves further consideration. Participative decision making is purported to be directly related to increased productivity, better quality decisions, reduced conflicts, and reduced costs (Mento, 1982). Increases in job satisfaction and morale due to participation in decision making have also been reported by many sources (Locke & Schweiger,1979; Loher, Noe, Moeller, & Fitzgerald, 1985; Griffin & Wayne, 1984; and Steel et al., 1985). Wood, Hull, and Azumi (1983:45) suggest that

when QCs follow the "true participative approach," QC members will be more satisfied with their supervisors and co-workers. Two other researchers have also found positive results associated with participative decision making. In studies of industrial settings; Nicholson, Wall, and Lischeron (1977) discovered that the amount of perceived influence in decisions about the work itself is directly related to absence, propensity to leave, and job satisfaction. McGowan (1983) also found in various studies that a strong positive correlation existed between the amount of participation and the level of communication and job satisfaction.

There have also been many studies linking productivity and Quality of Work Life to other aspects of Quality Circles. Wood, Hull, and Azumi (1983) suggest that both different sources and different types of feedback increase an individual's motivation and have a pcsitive impact on their job performance. Feeney reported in the early 1970s that when objective and measurable goals were set, performance feedback was an excellent means of improving productivity (Roll & Roll, 1983). Rice found that opportunities to increase the amounts of team work and social interaction result in higher productivity and morale (Roll & Roll, 1983). Since team work and the opportunity to meet socially with team members helps build group cohesiveness, one may assume then that high group cohesiveness is related

to high productivity and morale. Seashore found that high group cohesiveness in industrial settings was positively related to high productivity (Roll & Roll, 1983). Dyer further suggested that group membership results in better working relationships between employees on their regular jobs (Roll & Roll, 1983). Jelinek claims that the overall performance and innovative capacity of an organization is improved if problems are dealt with openly (Blair & Whitehead, 1984). She suggests that such open communication leads to a supportive, rather than a defensive, organizational climate.

Characteristics of QC Programs. As mentioned earlier, the Quality Circle concept is based on two assumptions. The first assumption is that the "experts" on a certain job are the people actually working on that job (Blair & Whitehead, 1984; Wood et al., 1983). The second assumption is that the causes of low productivity or poor quality are not known, but may be discovered by properly training employees in problem-solving methods (Cole, 1980a). The work force has the knowledge, but they lack the training necessary to use that knowledge effectively. Limitations on the potential use of employees' knowledge depend not on the workers themselves, but on management (Barra, 1983). It is management's responsibility to provide their employees with the necessary training to allow them to identify and solve work-related problems (Cole, 1980a). Dr. Ishikawa, the "Father of QCs"

in Japan, explains the importance of adequate training by saying, "A ton of enthusiasm is worthless unless backed by an ounce of scientific knowledge" (Dewar, 1980:201). This training is part of the people-building philosophy of QCs and is based on a very important principle of good management: "An involved and respected employee is a productive employee whose work is of the highest quality" (Fitzgerald & Murphy, 1982:7).

Wood, Hull, and Azumi (1983) state that American QC programs are built around a support structure. This support structure ensures that individual circles concentrate on organizational goals. There are four essential elements to this support structure: a steering committee, a facilitator, circle leaders, and circle members.

The steering committee is management's visible support of the QC program; it should therefore represent management. It usually consists of management level people, union leaders, and facilitators. In addition to establishing organizational goals and objectives for the QC program, the steering committee also sets policies to be followed by participants in the program. This committee usually monitors the weekly or monthly progress of individual circles, plans ways to publicize the QC program, and evaluates the effectiveness of the program. Most importantly, however, the steering committee provides an opening for improving communications between management and the work force (Ingle,

1982). Metz (1981:74) theorizes that the lack of a steering committee is the result of American management's "short term ethic." American managers typically desire fast results; they fail to realize that Quality Circles are a long range program that must be given a chance to mature fully.

The facilitator provides an official liaison between the circles and the steering committee representing management. Blair and Hurwitz (1984) believe the facilitator's primary purpose is to guide QCs so that they do not get involved in non-productivity issues. The facilitator can be best described as a "helper" whose role is to:

1. Promote and help implement the QC program.
2. Train QC members.
3. Guide the initial meetings of the circles.
4. Solve any problems that arise from the circles' activities.
5. Serve as liaison between circles and staff support personnel controlling resources the circles need (Wood et al., 1983:40)

This "helper" aids individual circles first getting started, acts as their consultant, and oversees their activities (Gryna, 1981). The facilitator obtains any information, support, or cooperation the circles feel they need from management to solve a problem. In return, he or she keeps management informed on the problems circles are analyzing. The facilitator must be able to work well with people and thus should have a strong background in human relations in addition to possessing knowledge aboutteaching

skills, statistical methods, and group dynamics (Ingle, 1982). The perceived status and amount of author-ity the facilitator possesses can be a good indicator as to how much support and importance top management gives to a QC program (Metz, 1981; Wood et al., 1983). Facilitators should be in a high enough position to have the ability to persuade supervisors and departments to abide by the rules of the QC process (Thompson, 1982).

Circle leaders are usually the immediate supervisors of the circle members; however, the leader may also be a natural one who emerges from within the circle. Circle leaders are responsible for getting their circles to work together as a team, and for directing and monitoring their activities. Before assuming the responsibility of leading a circle, however, a circle leader must be thoroughly trained in group dynamics, motivation, and problem-solving skills; training in leadership, communication, and management is also very helpful. Wood, Hull, and Azumi (1983) state that the purpose of leader training is to prepare the leader for the transition from an order-giving supervisor to a supportive, nondirective, and nonevaluative leader.

The last element of the support structure, the circle members themselves, is the most important one of the QC process. The "proper use of their untapped brainpower is the key to its success" (Ingle, 1982:47). Circle members will grow and mature because of the training they receive

in problem-solving skills and because of the chance they get to present recommendations directly to management (Dewar, 1980). Circle members are normally drawn from the same work area to ensure that they will have similar backgrounds and similar problems to work on. Quality Circle members are trained to conduct problem analysis using a retinue of QC "tools" (Rehg, 1976).

Quality Circles are usually trained in two types of techniques: problem-solving methods and group processes. Problem-solving methods include both statistical and analytical skills. Statistical skills include graphs, histograms, control charts, and sampling methods; analytical skills include cause and effect diagrams and Pareto analysis. While these skills are not very sophisticated, they do provide workers with a simple way of analyzing problems (Wood et al., 1983). To create an effective problem-solving team, training in group dynamics consists primarily of brainstorming and presentation methods. The major advantage of this training is that it gives employees the skills to analyze everyday work-related problems and encourages them to solve these problems on their own (Wood et al., 1983).

Motivational Theories

With proper training, Quality Circles provide a way of using the tremendous brainpower that our employees possess. Given that most people are creative and intelligent, it is

important for organizations to find ways of using that brainpower effectively (Ingle, 1982). According to Barra (1983), most workers feel that if they were more involved in the decisions affecting their jobs, they would be more productive. In order to do a good job, employees need to be enthusiastic and have pride in themselves and in their work. They cannot achieve this enthusiasm and pride however, unless they are given the opportunities to fully use and develop their ideas (Ingle, 1982). As Carver (1983:149) says, QCs provide these opportunities by offering employees "an open-ended dynamic process for experiencing" different needs and satisfying them.

This philosophy of need satisfaction for QCs is generally consistent with the various need theories of motivation (Blair & Whitehead, 1984). The two most frequently mentioned theories are Maslow's hierarchy of needs and Herzberg's two factor theory of need satisfaction. Since these theories are put forth as the motivational basis for virtually any new program, they will be mentioned only briefly. The remainder of this section will discuss job enrichment and the relationship between Quality Circles and job satisfaction.

Maslow's Hierarchy of Needs. Maslow's hierarchy of needs divides an individual's needs into five categories: physiological, safety, social, esteem, and self-actualization. His hierarchical theory implies that these

needs are ordered in level of importance and that higher level needs cannot be satisfied until the lower level needs are satisfied. One of the basic ideas behind Quality Circles is that each member has the same basic set of needs and that the group orientation of circles enables members to help each other satisfy these needs (Fitzgerald & Murphy, 1982). Group membership may be able to satisfy the economic, status, or friendship needs of most people (Szilagyi & Wallace, 1983).

> There is little question that groups are an integral part of any organization and that the basic choice is not whether to have them but, rather, how to create conditions under which group forces work toward organizational goals rather than counter to them (Schein, 1980:250).

Quality Circles appear to be an excellent means of accomplishing this. While circles are limited to working only on work and productivity related problems, the circle members have the opportunity to satisfy various needs. The need for friendship, affiliation, and meaningful interaction with others may be satisfied by joining a Quality Circle since QCs emphasize group problem solving and teamwork to accomplish their goals. Setting and attaining goals increases a person's self-respect and self-confidence, thus possibly satisfying Maslow's status need. Finally, people seeking personal growth and development, the self-actualization need, may also find it in QCs. Quality Circles may challenge them and permit them to use more innovative and creative approaches to problem solving.

Very little evidence exists to support Maslow's need hierarchy concept of motivation (Terpstra, 1979; Milton, 1981). The primary value of it, however, is its emphasis on recognizing and identifying individual needs for the purpose of motivating behavior (Terpstra, 1979). Managers must analyze and determine their employees' most important needs and then find a means of linking the satisfaction of those needs to performance.

Herzberg's Two Factor Theory. Herzberg's two factor theory of need satisfaction is based upon two types of motivational factors: hygiene factors and motivational factors. His theory is based on the following two major premises: (1) hygiene factors cause dissatisfaction when absent, but do not cause satisfaction when present and (2) motivational factors motivate when they are present, but do not cause dissatisfaction when they are absent (Donnelly et al., 1984). An important distinction between these two factors is that motivational factors are related to job content and hygiene factors are related to job context. Herzberg recommends that jobs should be "enriched" by making the work more meaningful and interesting. He also stresses that management should provide more opportunities to employees to experience motivational factors such as achievement, recognition, responsibility, advancement, and personal growth (Terpstra, 1979).

Quality Circles accomplish this by giving members the responsibility for identifying, analyzing, and solving work related problems. Circle members feel a great sense of achievement after having taken a problem and solving it by themselves; their self-esteem and self-confidence grow as they are recognized for their achievements. This leads to an increase in personal growth in the employees which will not only make them better employees, but also better prepare them for jobs of more responsibility.

Job Enrichment. Another way of conceptualizing the motivational properties of Quality Circles is by referring to the literature on job enrichment. Job enrichment is an organizational intervention intended to make jobs more challenging, motivating, and satisfying to the individual (Loher et al., 1985). Mento (1982) contends that the combination of statistical problem solving methods and participative decision making basically restructures the jobs of most QC members. Quality Circles thus enrich their jobs by adding supplementary tasks to the members' normal work load (Blair & Whitehead, 1984). Mento (1982) suggests that these supplementary tasks change the nature of the job in ways that might increase the job's potential to motivate. The fact that many descriptions of Quality Circles mention changes in job variety, task identity, task significance, autonomy, and feedback (Hackman & Oldham, 1980) appears to support contentions that QCs enrich the jobs of

their members. Wood, Hull, and Azumi (1983) point out however that QCs usually meet for only an hour per week; therefore, it is risky to assert that increased motivation, satisfaction, and performance within the circle will transfer back to employees' regular jobs.

Relationship Between QCs and Job Satisfaction. Quality Circle membership may enhance employees' levels of job satisfaction. QCs are purported to increase opportunities for participation in decision making and to enrich job characteristics. Research has linked participation in decision making and enriched task characteristics to job satisfaction. Hence, a QC-satisfaction link may be hypothesized.

Locke and Schweiger (1979) concluded that there is sufficient evidence for a link between participative decision making and increased morale and job satisfaction. They contend that this link is in the form of value attainment. Locke and Schweiger suggest that participation in decision making provides employees with a conducive environment to satisfy their various needs. These needs include respect, self-expression, influence, recognition, and independence (Locke & Schweiger, 1979). Mento (1982) argues that participative decision making also leads to increased trust, a sense of control, identification with the organization, and increased peer pressure and feelings of support. Nicholson, Wall, and Lischeron (1977) found

that perceived influence in decisions concerning the work itself was the primary factor related to the number of one-day absences by workers. Thus, participation in decision making leads to increased job satisfaction, and one of the features of QCs that has added to their popularity is their increased opportunity for participation in decision making. Therefore, it may be argued that Quality Circles increase job satisfaction through increasing opportunities for participative decision making.

Loher et al. (1985) found a moderate relationship between job characteristics and job satisfaction; they also found that this relationship was greatest for employees with high growth need strength. Loher et al. (1985) examined 28 previous studies that correlated measures of job characteristics with a measure of job satisfaction. Average correlation between job scope measures and job satisfaction was found to be about .39. The correlation between each of the five task characteristics and job satisfaction ranged from .32 for task identity to .46 for autonomy. For high growth need strength people and low growth need strength people, the correlation between job scope and job satisfaction was .68 and .38, respectively. As mentioned earlier, given that many QC descriptions refer to enhanced task characteristics, it may be concluded that Quality Circles increase job satisfaction by providing more opportunities to experience enrichment of the different task characteristics.

Loher et al. (1985) concluded from their results that the more complex and enriched a job is, the more likely that high growth need strength people will be more satisfied with their jobs because they will have increased opportunities for personal growth and development. Since QCs are voluntary and may be viewed as a form of job enrichment, it may be suggested that people joining QCs are high growth need strength people looking for challenging opportunities. Quality Circle members may therefore become more satisfied with their jobs.

To summarize this brief discussion, it has been shown that both participative decision making and task characteristics have a positive impact on job satisfaction. The literature on QCs in turn shows that Quality Circles employ such methods as participative decision making and enrichment of task characteristics. This study is consequently interested in the relationship between QCs and job satisfaction as obtained through participative management and increased opportunities for experiencing the various task characteristics. This QC-satisfaction relationship has been shown in previous research efforts by Steel et al. (1985) and Griffin and Wayne (1984). These studies are discussed in greater detail in the following section.

Previous Research

Beyond an abundance of opinions and anecdotal stories, there is very little research on Quality Circles or their

influence upon various attitudinal outcomes. Steel and Shane (1985) cite two principal types of research: anecdotal appraisals and cost savings data and more conventional research using either longitudinal designs or control groups. They point out however, that the first category, anecdotal appraisals and cost savings, are more often than not estimates of reduced work times and as such should be regarded somewhat skeptically. They also suggest that the majority of conventional studies have been susceptible to a common set of methodological deficiencies (Steel & Shane, 1985). They stress, however, that enough studies have reported positive results to justify further research. The remainder of this chapter reviews the results of six of these research studies.

Hunt (1981). Hunt (1981) conducted a study of a six-month long pilot program implemented by General Dynamics Pomona Division. Two sites were chosen for the study; both consisted primarily of electronics assembly work but differed in organizational structure and environmental/ economic conditions. One site contained 7000 unionized employees while the other site contained 500 non-union employees.

Hunt's study was not a controlled experiment; it was a field observation consisting of one interjected variable: Quality Circles. Various measurements for the six months between 1 January and 30 June 1980 were compared to the

same time period in 1979. Two types of outcomes were monitored: morale/motivation outcomes and performance outcomes. Morale/motivation outcomes were measured with six variables: number of employee suggestions, attrition rate, an attitude survey, attendance figures, number of grievances filed, and management's perceptions about the program. Performance outcomes were measured in terms of the results of QC problem solving projects.

The results of this study are very subjective and inconclusive. The percentage of QC members submitting suggestions increased significantly ($p<.05$) during the six month study. The number of non-QC members submitting suggestions dropped however. Attrition was reported to be eight percent in circles and 25 percent factory-wide. These results may be attributed to factors other than the Quality Circle program. They may simply be due to the Hawthorne effect of increased motivation as a function of increased management attention. Another explanation may be that the people who joined these QCs were already highly involved and satisfied with their work. Thus, similar results may have been obtained even if these groups were monitored without the interjection of Quality Circles. No differences in attendance or number of grievances filed were reported.

Measures of performance outcomes were also subjective. The value of each circle's activities was measured in terms

of costs and anticipated time savings. The estimated dollar savings per circle was $3500 for six months with a projected savings to cost ratio of seven to one by June 1981 if 45 circles were operational by then.

No attempts were made to control any outside forces affecting the circles. The composition of each circle continually changed because employees were constantly being transferred to where they were needed the most. There was inconsistent management support; one circle had three successive supervisors within the six month period. New equipment and new leadership were not taken into account. In one circle, a new supervisor was assigned before QCs were even implemented and improvements showed up almost immediately. These improvements continued after circles were implemented and were partially attributed to the circle's activities.

There is a lack of statistical control over many aspects of Hunt's study. These results are simply field observations; thus, conclusions drawn from them must be tempered by the limitations of the study's design.

Donovan and Van Horn (1980). Donovan and Van Horn (1980) conducted a study at Honeywell in which they examined the activities of five Quality Circles. Two of these circles were pre-post design studies while the other three were pre-post design with control group studies. These researchers feel that multiple levels of measurement are

necessary for any kind of systematic evaluation of QC programs. Their first level of measurement consisted of costs and savings associated with the QC program. They monitored savings through productivity and quality improvements and monitored costs through training times, meeting times, and program staff support. The second level of measurement consisted of assessing the impact the QC program had on the organizational climate and on people's attitudes.

To adequately evaluate this second level, Donovan and Van Horn developed the Job Reaction Survey to measure nine job and climate-related variables they feel are consistently associated with high productivity and satisfaction. These variables include cooperation, communication, management responsiveness, use of job knowledge, role clarity, participation, feedback, task significance, and recognition. The survey combines these variables to also measure employees' overall satisfaction with work and the work group's perceptions about their own overall effectiveness.

Results of the five circles Donovan and Van Horn examined are briefly discussed below. The first two cases are the pre-post design studies with the following three cases representing pre-post with control group designs.

Case 1. Using a baseline of one year's results, new results were taken two years after circles were implemented. These results indicated a 46 percent reduction in assembly costs per unit over two years.

Case 2. After obtaining a baseline measure of three months, another survey was conducted nine months later. Results showed $86,430 in documented savings, a 36 percent reduction in assembly costs per unit, and significant improvements on several attitudinal variables.

Case 3. During a six month interval, three pilot assembly lines containing QCs significantly increased their productivity over six control lines ($p<.01$).

Case 4. During the time it took to produce 3550 units, an assembly line containing QCs descended a learning curve 6 percent faster than a line without QCs. This resulted in about five dollars per unit in savings.

Case 5. During a nine month interval, machine operators belonging to QCs improved their machine utilization rates 9 percent more than operators who were not QC members.

Tortorich, Thompson, Orfan, Layfield, Dreyfus, and Kelly (1981). Tortorich et al. (1981) conducted a study of the effectiveness of Quality Circles implemented at Martin Marietta Aerospace Michoud Division. Their research consisted of a concurrent study of members before receiving QC training compared with members active in a circle for at least six months. The effectiveness of QCs was measured in three categories: direct program outcomes, personal outcomes, and organizational outcomes.

Direct program outcomes included a 33 percent growth in QCs in one year. There was also a 43 to 46 percent increase each in the number of projects considered by circles, the number of management presentations, and the number of proposed solutions approved by management. Personal outcomes were monitored using a survey which measured 25 variables relating to employee attitudes. Tortorich et al. (1981:28) state that there was a "marked effect on employee attitudes toward themselves, their co-workers, supervision, and the opportunities for personal growth and development within the organization."

In the area of organizational outcomes, these researchers chose to show "how well they (QCs) are working" and how well QC members do on their regular jobs. To do this, they tracked and monitored six types of organizational outcomes:

1. Product Quality Non-conformances
2. OSHA logged accidents
3. Safety incidents
4. Lost time hours
5. Grievances
6. Attitude related attrition

These six areas were then broken down and analyzed in terms of three categories of employees: hourly vs salaried, circle members vs non-circle members, and circle members six months before joining vs circle members six months after joining.

Based on monthly comparisons over 18 months using man rates; OSHA logged accidents, safety accidents, and number

of grievances filed were consistently lower for QC members. Using improvements over a six month time period as a basis for comparison, QC members reduced their lost time hours much more than non-QC members. Attitude related attrition, however, rose slightly for QC members and dropped slightly for non-members. Attrition was still slightly higher for non-members.

Product quality non-conformances were studied six months before QC implementation and six months after QC implementation. Sixteen six-month intervals between January 1978 and January 1981 were used. The six month composite man rate for QC members improved 59 percent for non-conformances. This is compared to the company-wide improvement figure of 25 percent. Additionally, six months before QC implementation, QC members were experiencing a non-conformance rate 18 percent higher than non-members. Six months after implementation, the rate of non-conformance for QC members was 33 percent lower than non-members.

Griffin and Wayne (1984). Griffin and Wayne (1984) compared the characteristics of effective and less-effective Quality Circles in nine manufacturing plants. Effectiveness was defined as the number of quality improvements suggested, the number of quality improvements adopted, and average member satisfaction. Only QCs in existence for at least one year were studied. There were

two distinct differences in these circles: leadership rotated from meeting to meeting and financial incentives of $100 to $1000 were available.

Effectiveness measures were collected for a twelve month period and averaged. Those circles with measures above the mean were described as effective, those below the mean as less-effective. Social variables were collected at the midpoint of the twelve month period; responses for these variables were averaged to establish a group profile for each circle.

Griffin and Wayne found that significant differences existed at the .01 level between effective and less-effective circles on various variables. These variables include group cohesiveness, performance norms, job satisfaction, intrinsic satisfaction, satisfaction with co-workers, self-esteem, self-monitoring, and organizational commitment. Griffin and Wayne point out that these differences were in the direction predicted and can be explained by the theories of small group dynamics and social behavior of individuals.

Various weaknesses and strengths were cited by the researchers. Since group averages were used, the resultant sample size was small. The major weakness of the study, however, is its cross-sectional nature which denied the study the advantage of causal inference. A big plus for this study is its group analysis. As far as Griffin and

Wayne know, this is the first study of its kind involving a small group perspective. Thus it explores new territory and raises new questions that need answering.

Atwater and Sander (1984). Atwater and Sander (1984) compared the effects of implementing six Quality Circles each in three Navy organizations. Two types of control groups were used in their study. People not participating in QCs were randomly selected from each work area implementing QCs to serve as one control group. The other control group consisted of two Navy organizations not implementing QCs.

Their results indicated that no sizable changes occurred in either direction in QC members' attitudes. This conclusion was reached by visual examination since the differences were so small; no statistical tests were conducted. Statistical comparisons of attitudes of QC members versus QC controls within work areas implementing QCs found significant differences in four attitude scales at the .05 level. There was a significant amount of improvement for QC members over controls on perceptions about job ambiguity, amount of input into decisions, and work group effectiveness. QC members' perceptions about fairness of pay significantly decreased.

Atwater and Sander found that neither volunteering to participate in QCs nor changes caused by belonging to a QC were related to job involvement. Instead, their results

indicate that joining or belonging was related to attitudes and perceptions about the work itself. They found that blue-collar workers with negative attitudes and perceptions were most likely to join a circle while white-collar workers were most likely to join if they had positive attitudes and perceptions. Since the problem solving atmosphere of QCs is new to most blue-collar workers, Atwater and Sander suggest that these workers are most likely to try QCs only if they are dissatisfied with their present jobs. The problem solving atmosphere of QCs is similar to many white-collar workers' normal job; therefore, those with positive feelings about their present job are most likely to get involved with QCs.

This research also found that previous attitudes of QC members toward supervisors before QC implementation may have determined that level of management to which presentations were made. This presentation level may also have an effect on QC members' attitudes toward supervisors. Members with higher opinions of management were more inclined to make their presentations to a higher level of management. Communicating with a higher level of management may lead to increased positive attitudes.

Sick leave was found to be highly correlated to job attitudes such as job involvement, how much time drags by at work, perceptions about managerial support of QCs, job satisfaction, and organizational commitment. Sick leave

was not affected by participation in QCs however; QC members used less sick leave than non-QC members both before and after the QC program was started.

Organizational changes precede attitude changes. The time period of one year for this study may have been sufficient to observe changes in sick leave use and changes in people's attitudes toward QCs. It may not have been long enough however, to observe any changes in people's job attitudes. Job attitudes change slowly over long periods of time.

Steel, Mento, Dilla, Ovalle, and Lloyd (1985). This research consisted of studying the effects of implementing Quality Circles in two Department of Defense organizations: a base civil engineering squadron and a base hospital. The research was conducted using a nonequivalent control group design. Initial survey data were collected in October 1982; post-measure data were collected for the hospital in May 1983 and for the civil engineering squadron in November 1983.

The hospital had six work areas volunteer to implement QCs and designated six other functionally equivalent areas to serve as control groups. The civil engineering squadron had five work areas volunteer and designated four other areas as control groups. Two of the civil engineering circles were discontinued during the study. Each organization initially used a full-time facilitator. The civil

engineering facilitator, however, had considerable experience and training in QCs and conducted training for the QC leaders of both organizations. This training was attended by all of the civil engineering QC leaders, but by only two out of six of the hospital QC leaders. The civil engineering leaders offered training to their circle members whereas the hospital leaders did not. Additionally, the civil engineering facilitator attended 90 percent of all QC meetings in the civil engineering squadron.

Analysis of covariance results for the civil engineering QCs indicated that seven out of twenty variables measured showed significant improvements: goal difficulty, job satisfaction, group cohesiveness, participative decision making, supervisory subtlety, work group support, and egalitarianism. There were no significant effects on any of the variables for the hospital sample.

The amount of change occurring between pre- and post-measures was also examined. For the civil engineering squadron, QCs seem to have influenced all measured variables to some extent. For active QC members, the amount of change was significant at the .05 level for feedback, task-oriented supervision, and egalitarianism. Additionally, 15 of the 20 variables showed some improvement. These results were in clear contrast to those for the hospital QCs. In the hospital QC program, sixteen of the twenty variables showed a decrease in scores with four of these being

significant reductions: job involvement (Central Life Interest), job involvement (Self-Concept), relationship-oriented supervision, and impersonality of institutions.

In terms of perceptions about managerial support, the ratings were significantly higher for QC members in civil engineering. These members also had significantly higher perceptions about their suggestions being implemented.

Steel et al. (1985) point out that some of these contradictory results may be explained by the different time spans involved: seven months for the hospital sample and thirteen months for the civil engineering sample. They stress however, that these different time spans do not explain why the attitudes declined in the hospital sample. Stating that the hospital "depicts an almost classic scenario of raised expectations followed by disillusionment" (p. 116), Steel et al. (1985) cite three problem areas that may have lead to such poor results: resignation of the facilitator after three months, inadequate training of both leaders and members, and lack of managerial support. According to Steel et al. (1985), this illustrates how important genuine management support, provision of necessary resources to keep the program going, and proper training are to the successful intervention of Quality Circles into any organization.

Steel, Ovalle, and Lloyd (1982). This research was a longitudinal study using a nonequivalent control group

design conducted by the Air Force Institute of Technology and the Leadership and Management Development Center. Steel, Ovalle, and Lloyd (1982) compared 14 QC groups to 37 control groups between September 1980 and May 1981. A survey was administered to the entire organization at both of these times. The survey measured employee attitudes, beliefs, behavioral intentions, and demographic characteristics. The non-demographic items on the survey were related to 23 underlying psychological factors. Data were analyzed using stepwise hierarchical regression analysis.

The results of this study indicated that QC participation had very little effect on the attitudes of survey participants. Steel et al. (1982) state that this conclusion must be regarded as very tentative, however. They cite several technical and design flaws in the study that may lessen the validity and generalizability of its results:

1. Some QCs did not have the opportunity to grow and fully mature. The QCs did not all begin at the same time and three of them were in existence for less than a month at the time of the study.

2. Experimental mortality altered the characteristics of the sample in both treatment conditions. There were also many changes in the composition of various groups.

3. Treatment groups were not equal at the beginning of the study period. Some leveling did occur however during the eight months of the study.

4. Non-attitudinal measures such as cost savings and increased productivity were not considered.

5. The small sample size increased the probability of obtaining Type II errors.

Hypotheses

Organizations may be able to benefit from using Quality Circles or some other form of participative management; however, the utility of such interventions may depend on the situation of the organization. As far as civil engineering is concerned, the preliminary data has yielded mixed results. In one study, Steel et al. (1985) found that seven out of twenty variables measured were significantly affected by QCs. They also found that most of the measured variables were influenced to some degree when comparing pre- and post-measure data. Fifteen out of twenty variables improved somewhat. In another study, Steel et al. (1982) concluded that QC participation had very little effect on employees' attitudes. Several technical and design flaws, however, cause the results of this particular study to be treated cautiously. Therefore, further research is needed to clarify the value of Quality Circles for organizations of this type.

As previously mentioned, the principle intent of this research is to assess whether a relationship exists between Quality Circle membership in civil engineering organizations and level of employee morale/satisfaction. The

formal hypotheses listed below were based upon previous research (e.g., Steel et al., 1985; Griffin & Wayne, 1984) suggesting links between QCs and satisfaction/morale.

Hypothesis 1. Members of Quality Circles are more satisfied with their jobs than are nonmembers.

Hypothesis 2. Members of Quality Circles feel their work groups form a more cohesive unit working in a cooperative manner than do nonmembers.

Hypothesis 3. Members of Quality Circles perceive more of an opportunity to actively participate in making decisions which affect their work or their immediate work group than do nonmembers.

Hypothesis 4. Members of Quality Circles perceive that there is an ample flow of information within the organization more so than do nonmembers.

Hypothesis 5. Members of Quality Circles will possess a greater strength of identification and involvement in their organization than will nonmembers.

Hypothesis 6. Members of Quality Circles will develop a stronger sense of personal involvement in their jobs than will nonmembers.

Hypothesis 7. The amount of self-reported effort expended in performing their jobs will be greater for members of Quality Circles than for nonmembers.

Hypothesis 8. Self-rated job performance will be higher for members of Quality Circles than for nonmembers.

Hypothesis 9. Members of Quality Circles will express a stronger desire to continue working in their present organization than will nonmembers.

Hypothesis 10. Members of Quality Circles will use less sick leave than will nonmembers.

III. Method

Sample and Setting

Samples from five civil engineering squadrons each located on a different Air Force base provided the data for this study. Statistics were based upon 202 cases: 52 QC members and 150 non-QC members. Of this group, 80 respondents were civilian and 122 were active duty military personnel. The typical employee was between 26 and 30 years old, had graduated from high school with some college work but no degree, and had been employed by their respective organizations for 18 to 24 months.

Of 16 base civil engineering squadrons originally thought to contain Quality Circles and contacted during the preliminary research phase of the study, organizations on five bases were the only ones found to be presently utilizing Quality Circles. Two other bases known to have civil engineering organizations with successful QC programs were not included in the study because it was felt that they had already been subjected to an overabundance of research. Each organization employed between 430 and 940 employees divided approximately equally among military and civilian personnel. The bases in question were located in widely dispersed areas of the country: one base each in the Northwest, Southeast, and Northeast; and two bases in the Midwest.

Procedure

Two methods were used to select study participants for this research. A random data base search was used to select military non-QC members. Points of contact were established at each base to select the remaining study participants. These contacts were instructed to distribute surveys to all QC members and to a random sample of civilian non-QC members. The contacts were asked to select these civilians in a way to include different work areas and different grades to ensure some sense of a random sample.

Surveys were thus distributed and returned by mail during the month of July 1985. Study participants were assured of the voluntary nature of their participation. They were also informed of both the purpose of the survey and of the anonymity of their responses. Response rates were relatively low for the surveys: 41 percent (202 out of 492).

Measures

The data for this study was obtained through the use of a survey questionnaire based upon a larger QC-oriented instrument, the Air Force Institute of Technology's (AFIT) Survey of Work Attitudes (Steel et al., 1985). The questionnaire consisted of five demographic items, three items relating to motivational outcomes, five items relating to QC membership, and 52 Likert-type items relating to various attitudinal outcomes. The questionnaire items are shown in Appendix A.

The nonequivalent control group study of a civil engineering organization conducted by Steel et al. (1985) provided reliability coefficients for many of these measures. A summary of these alpha coefficients is shown in Table 1. Reliabilities determined for the present study are discussed in the next chapter.

Job Satisfaction. The AFIT Survey of Work Attitudes measured job satisfaction with an instrument developed by Andrews and Withey (1976:414). Andrews and Withey (1976) performed factor analysis on 63 items measuring social indicators of well-being. Their analysis resulted in 15 factors, one of which included five questions relating to a person's job. The loadings for these questions ranged from .56 to .72. Item intercorrelations found by Andrews and Withey (1976:55) are given in Table 2. Correlations not reported by the authors are designated as NG. The instrument used in the present study thus consisted of five items with responses ranging from disgusted (1) to delighted (7). Intercorrelations determined for the present study are discussed in the next chapter.

Job Performance. Based upon work by Steel et al. (1985) and Steel and Ovalle (1984b), job performance was measured with five self-rated items with responses ranging from far worse (1) to far better (7) than other comparable employees. In two studies conducted at the National Aeronautics and Space Administration (NASA), Mott (1972) found that performance self-ratings and top-management

Table 1
Reliabilities Found by Steel et al. (1985)

Measure	Reliability
Job Satisfaction	.78
Job Performance	.91
Organizational Commitment	.88
Central Life Interest	.89
Self-Concept	.75
Group Cohesiveness	.80
Communication Climate	.73
Participation in Decision Making	.74

Source: Steel et al. (1985:103)

Table 2
Intercorrelations Found by Andrews and Withey (1976)

Variable	Q7	Q8	Q9	Q10	Q11
Q7, Job itself	1.0	.58	.58	.46	.43
Q8, Co-workers		1.0	.48	.46	NG
Q9, Work itself			1.0	.42	NG
Q10, Job: What like there				1.0	.42
Q11, Job: Resources					1.0

Source: Andrews and Withey (1976:55)

performance ratings were correlated at the r = .55 (p <.05) level for one study and at the r = .72 (p <.01) level for the other study. The self-appraisal instrument employed by the AFIT Survey of Work Attitudes was studied and validated by Steel and Ovalle (1984b) in their study of finance-company managers. In the present study, participants were asked to rate their work performance based upon feedback received from their supervisors. Work performance was self-rated in five areas: quantity, quality, ability to anticipate and solve problems, efficiency, and adaptability/flexibility.

Organizational Commitment. The AFIT Survey of Work Attitudes measured organizational commitment with the Organizational Commitment Questionnaire (OCQ) developed by Mowday, Steers, and Porter (1979). Their questionnaire examined the strengths of three related factors: (1) belief in and acceptance of the organization's goals and values, (2) willingness to help the organization by exerting a considerable amount of effort, and (3) desire to remain a member of the organization (Mowday et al., 1979). The questionnaire contains 15 items with responses ranging from strongly disagree (1) to strongly agree (7). Items marked with an 'R' in the Appendix were negatively stated and reversed scored in an attempt to reduce response bias.

Mowday, Steers, and Porter (1979) obtained consistenly high internal consistency reliabilities in their nine years of research on the OCQ. Alpha coefficients ranged from .82

to .93 with a median of .90 for over 2500 respondents taken from nine widely diverse work organizations. Reasonable levels of convergent, discriminant, and predictive validity were also found by Mowday et al. (1979).

Job Involvement. The measurement of job involvement was based on the findings of Saleh and Hosek (1976). Using factor analysis on 65 survey items, Saleh and Hosek found that three factors emerged relating to job involvement. Steel, Kohntopp, and Horst (1983) further refined Saleh and Hosek's work by selecting only those items with high average loadings and high communalities from each factor. Steel, Kohntopp, and Horst (1983) labeled the three factors originally found by Saleh and Hosek (1976) as Work Participation, Central Life Interest, and Self-Concept. Work Participation, measured with five items, is "the degree to which an employee is participating in his job and meeting such needs as prestige, self-respect, autonomy, and self-regard" (Saleh & Hosek, 1976:214). Central Life Interest, also measured with five items, taps "the degree to which the total job situation is a central life interest" (Saleh & Hosek, 1976:213). Self-Concept, measured with three items, is "the degree to which the employee perceived that his job performance is central to his self-concept" (Saleh & Hosek, 1976:214). These 13 items employed responses ranging from strongly disagree (1) to strongly agree (7).

In their work; Steel, Kohntopp, and Horst (1983) estimated internal consistency reliabilities for Work Participation, Central Life Interest, and Self-Concept scales to range from .77 to .85, .87 to .91, and .63 to .93, respectively.

Work Role Attitudes. Work role attitudes were measured in terms of participation in decision making, group cohesiveness, and organizational communication climate with five, three, and four, items, respectively. These items contained responses ranging from strongly disagree (1) to strongly agree (7).

Job Effort Ratings. Participants were asked to rate the typical amount of effort they normally put into doing their work. Responses ranged from very little effort (1) to very much effort (5). In his study of expectancy models, Mitchell (1974) reviewed two studies involving self-ratings of job effort. One study, by Mitchell and Albright, found a Pearson correlation of .64 ($p < .01$) while the other study, by Lawler and Suttle, found a correlation of .39 ($p < .01$) between job effort scores and self-ratings of effort (Mitchell, 1974). These studies examined the relationship between self-ratings of effort and effort scores resulting from the use of a mathematical equation representing an expectancy model. A brief explanation of this model is given by Mitchell (1974) as:

> Job effort was being predicted from the expectancy that a given level of effort led to a given level of performance weighted by the valence of that performance level. The valence of this performance level was then determined by examining the degree to which it was instrumental for the attainment of second-level outcomes weighted in turn by their valence (p. 1055).

Intent to Remain. Participants were asked to state their intentions in regards to whether or not they will remain with the Air Force/civil service. Responses ranged from definitely will not remain (1) to definitely will remain (5). Kraut (1975) found that intent to remain was correlated with actual turnover. He found a correlation between intent to remain and voluntary turnover of $r = -.17$ ($p < .01$) for turnover occurring within 18 months of stating an intention to remain. For turnover occurring within 1.5 to 5.5 years of stated intentions to remain, Kraut again found an r of -.17 ($p < .01$). Kraut (1975:240) suggested that "a direct measure of an employee's intent to remain with an organization is a more powerful predictor of his later turnover than are other measures of job satisfaction."

Steel and Ovalle (1984a) reviewed available literature on the link between behavioral intentions and turnover. Using meta-analysis, they computed a weighted average correlation of .50 between behavioral intentions and employee turnover. Two of the studies reviewed by Steel and Ovalle (1984a) concerned Air Force (AF) personnel. According to Steel and Ovalle (1984a), Shenk studied the

intention-turnover link among AF officers and found point-biserial correlations ranging from .24 to .65 (all $p < .01$) for predictive periods of one through six years. Citing Alley and Gould's study of AF enlisted personnel, Steel and Ovalle (1984a) reported point-biserial correlations of .14 to .52 (all $p < .01$) for predictive intervals of one through four years.

Sick Leave Usage. Steers and Rhodes (1978) argue against the assumption that absenteeism and turnover share common roots. They suggest instead that the study of turnover and absenteeism should be conducted each in their own right. Thus, participants were asked to estimate the number of sick days they took in the previous calendar year.

Atwater and Sander (1984) concluded from their study that sick leave usage was not effected by QC membership. They did find, however, that the amount of sick leave taken was significantly correlated with job involvement, job satisfaction, and organizational commitment.

Analysis

Statistical analysis consisted of three different procedures for this study: reliability estimation, Pearson correlations, and Student's t-test.

Reliability Coefficients. Cronbach's coefficient alpha was used to determine the internal consistency reliability of each measure. Reliability coefficients estimate how free a measurement is of random or unstable

errors; they estimate the degree of consistency among results. Alpha coefficients may range from .00 to 1.00 with 1.00 representing a perfectly homogeneous measure.

Pearson Correlations. Bivariate correlation analysis subsumes a number of statistical methods which provide a single index to describe the relationship between two variables (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). Pearson product-moment correlation is one such method; it indicates the extent to which the variation in one variable is related to the variation in the other variable. In other words, it measures the degree of linear relationship between two variables. Correlation values may range from +1.0 to -1.0.

Student's T-Test. Student's t-test was used to determine whether differences between two sample means were statistically significant. The t-test between sample means was used to determine if differences existed on any of the measures used in the present study between QC members and non-members. In statistical analysis, significantly different means "indicative of" or "signifying" a true difference in means between the two populations being studied (Nie et al., 1975:267).

IV. Results

Demographic Characteristics

Demographic characteristics measured in this study include the respondent's age, education level, length of time in present organization, and pay grade level. The items used to measure these characteristics are shown in Appendix A.

Four types of t-tests, or comparison of means, were performed to determine if any significant differences existed on any of the demographic characteristics. The first t-test compared QC members to all non-members responding to the survey. The second test compared employees working in departments that used Quality Circles to employees working in departments that did not use QCs. The demographic characteristics of QC members were compared to those of non-members working in the same departments. Finally, the last test compared demographic variables for QC members to those of non-members working in departments that did not use QCs. The results of these t-tests are shown in Tables 3, 4, 5, and 6, respectively.

To understand the meanings of the various scores shown in these tables, the following legend should be kept in mind. For more detail, refer to the appropriate questions shown in Appendix A.

Age:

3 represents ages 26 to 30

4 represents ages 31 to 40

Education:

3 represents some college work but no degree

4 represents associate's degree or LPN

Months in organization:

5 represents 18 months or more, but less than 24 months

6 represents 24 months or more, but less than 36 months

7 represents 36 months or more

Pay grade:

3 represents pay grades 5 and 6

4 represents pay grades 7 and 8

The results shown in Table 3 indicated that all four demographic variables measured were significantly higher for QC members than they were for non-members. QC members appeared to be older and better educated; they had worked in their present organization longer; and they had obtained a higher pay grade than non-members.

Table 4 shows that employees of work groups containing Quality Circles are significantly older and have been employed by their current organization significantly longer than employees of work groups not using Quality Circles. Education levels were not significantly different, and the pay grade was only slightly higher for employees of work groups using QCs.

Table 3
Demographic Characteristics of QC Members and Non-Members

	QC Member		Non-Member		
Variable	M	SD	M	SD	t
Age	3.90	1.36	3.19	1.29	3.37**
Education	3.67	1.48	3.09	1.25	2.75*
Months in Organization	6.10	1.27	5.23	1.72	3.34**
Pay Grade	3.85	1.82	3.01	1.48	3.32**

Note: For QC members, N = 52; for non-members, N = 150.
All statistical tests were two-tailed tests.
* $p < .01$. ** $p < .001$.

Table 4
Demographic Characteristics of Employees in Work Groups Using QCs and of Employees in Work Groups not Using QCs

	Work Groups with QCs		Work Groups without QCs		
Variable	M	SD	M	SD	t
Age	3.84	1.38	3.06	1.23	4.23*
Education	3.28	1.42	3.22	1.28	0.33
Months in Organization	5.95	1.48	5.11	1.69	3.65*
Pay Grade	3.41	1.69	3.09	1.55	1.40

Note: For work groups with QCs, N = 82; for work groups without QCs, N = 120. All statistical tests were two-tailed tests. * $p < .001$.

As shown in Table 5, QC members differ significantly from non-members employed by work groups using QCs in their levels of both education and pay grade. The ages and length of organizational membership for the QC members were only slightly higher.

The results shown in Table 6 are very similar to those shown in Table 3. Quality Circle members differ significantly from non-members working in departments not using QCs on all four variables.

In summary then, it appears that work groups containing Quality Circles were more likely to contain employees who are older and have been with their current organization longer. From these work groups, employees who elect to join a QC are most likely to be those employees with higher educations and pay grades. When compared with non-members in general, QC members appear to be significantly higher than non-members on all four demographic variables.

These results indicated that QC members and non-members did not form a homogeneous group; they did not appear to come from the same population. These results indicate that the possibility of group composition biases may effect the ensuing results to an unknown extent. The fact that QC and non-member comparison groups were found to differ on these demographic characteristics raises the possibility that attitudinal differences may in fact represent the influences of group differences rather than the influence of QC participation, per se. Therefore, further

Table 5
Demographic Characteristics of QC Members and Non-Members from Work Groups Using QCs

	QC Members		Non-Members from Work Groups Using QCs		
Variable	M	SD	M	SD	t
Age	3.90	1.36	3.65	1.48	0.87
Education	3.67	1.48	3.00	1.36	2.29*
Months in Organization	6.10	1.27	5.63	1.71	1.53
Pay Grade	3.85	1.82	3.02	1.55	2.34*

Note: For QC members, N = 52; for non-members, N = 43. All statistical tests were two-tailed tests.
* $p < .05$.

Table 6
Demographic Characteristics of QC Members
and Non-Members from Work Groups not Using QCs

	QC Members		Non-Members from Work Groups Not Using QCs		
Variable	M	SD	M	SD	t
Age	3.90	1.36	3.01	1.17	4.28***
Education	3.67	1.48	3.13	1.21	2.47*
Months in Organization	6.10	1.27	5.07	1.71	3.85***
Pay Grade	3.85	1.82	3.00	1.45	3.16**

Note: For QC members, N = 52; for non-members, N = 107.
All statistical tests were two-tailed tests.
* $p < .05$. ** $p < .01$. *** $p < .001$.

comparisons between QC members and non-members will need to bear in mind these basic demographic differences between the groups when attempting to draw any meaningful conclusions from the findings.

Reliabilities

Internal consistency reliabilities, or alpha coefficients, were calculated for nine attitudinal measures as shown in Table 7. Reliability coefficients ranged from a low of .72 for the self-concept measure of job involvement to a high of .94 for self-rated job performance. Reasonably high reliability coefficients such as these indicate that the measures are relatively free from random or unstable errors. The individual measures thus consist of homogeneous groups of items resulting in more precise measurement.

Based on the previous reliability results presented in Chapter III, the alpha coefficients found in the present study are consistent with previous findings. It was somewhat surprising, however, to find that the reliabilities for the participative decision making measure and the communication climate measure to be quite a bit higher than those found by Steel et al. (1985). They found a coefficient alpha of .74 (vs .90) and .73 (vs .81) for these measures, respectively.

Table 7
Internal Consistency Reliabilities for Attitudinal Variables

Variable	N of Items	N of Cases	Scale Mean	Reliability (alpha)
Job Satisfaction	5	202	15.50	.78
Job Performance	5	201	25.86	.94
Organizational Commitment	15	192	60.67	.93
Job Involvement Work Participation	5	202	24.96	.88
Job Involvement Central Life Interest	5	200	15.98	.93
Job Involvement Self-Concept	3	202	17.76	.72
Participation in Decision Making	5	200	21.12	.90
Group Cohesiveness	3	202	13.35	.83
Communication Climate	4	199	18.59	.81

Correlational Analysis

Intercorrelations were computed between the nine attitudinal variables, and between the demographic variables and three self-reported outcome measures: job effort rating, intent to remain/quit, and sick leave usage. The purpose of this correlational analysis was to determine whether any differences existed between different groups of employees.

Intercorrelations between each attitudinal variable were computed for three groups of employees. Table 8 contains the intercorrelations among the nine attitudinal variables for the group of QC members. The lowest correlations obtained involved correlates of either the self-concept measure of job involvement or job performance; all other intercorrelations were significant beyond the .001 level. However, most job performance and job involvement (self-concept) correlations were still significant beyond the .05 level. The highest intercorrelation ($r = .82$) was between group cohesion and communication climate. The variables with the consistently highest intercorrelations across all other variables, however, were job satisfaction and participation in decision making.

Table 9 includes two sets of correlations. Those above the main diagonal are for non-QC members employed in work groups not using Quality Circles; values below the main diagonal are for non-QC members employed in work groups using QCs. For non-members from QC work groups

Table 8
Intercorrelation Matrix of
Nine Attitudinal Variables for QC Members

	1	2	3	4	5	6	7	8	9
1. Job Satisfaction	1.00	.32**	.71***	.68***	.74***	.41***	.71***	.58***	.53***
2. Job Performance		1.00	.34**	.48***	.25*	.28*	.41**	.17	.16
3. Organizational Commitment			1.00	.60***	.72***	.30**	.64***	.52***	.50***
4. Job Involvement Work Participation				1.00	.59***	.42***	.63***	.49***	.58***
5. Job Involvement Central Life Interest					1.00	.35**	.66***	.44***	.55***
6. Job Involvement Self-Concept						1.00	.36**	.18	.20
7. Participation in Decision Making							1.00	.67***	.66***
8. Group Cohesiveness								1.00	.82***
9. Communication Climate									1.00

Note: For all values, $50 \leq N \leq 52$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 9
Intercorrelation Matrix of Nine Attitudinal Variables for
Non-Members in Work Groups Using QCs and Non-Members in Work Groups not Using QCs

	1	2	3	4	5	6	7	8	9
1. Job Satisfaction	-	.11	.70***	.60***	.40***	.22*	.60***	.60***	.75***
2. Job Performance	.49***	-	.15	.32***	.15	.41***	.36***	.19*	.10
3. Organizational Commitment	.77***	.49***	-	.55***	.52***	.31***	.53***	.41***	.51***
4. Job Involvement Work Participation	.69***	.50***	.69***	-	.48***	.30***	.63***	.47***	.56***
5. Job Involvement Central Life Interest	.67***	.44***	.77***	.62***	-	.51***	.30***	.25**	.24*
6. Job Involvement Self-Concept	.60***	.50***	.57***	.57***	.53***	-	.24**	.25**	.15
7. Participation in Decision Making	.57***	.28*	.73***	.74***	.60***	.44**	-	.60***	.65***
8. Group Cohesiveness	.64***	.36**	.60***	.73***	.59***	.43**	.54***	-	.75***
9. Communication Climate	.71***	.30*	.79***	.73***	.61***	.45**	.73***	.80***	-

Note: Intercorrelations for non-QC members employed in work groups not using QCs appear above the main diagonal (N = 107). Intercorrelations for non-QC members employed in work groups using QCs appear below the diagonal (N = 43).
* $p < .05$. ** $p < .01$. *** $p < .001$.

(values below the diagonal), the lowest intercorrelations were found among correlates of either job performance or the self-concept measure of job involvement. All intercorrelations were still significant beyond the .05 level, however. In fact, the lowest correlation (r = .28) was between participation in decision making and job performance. Highest intercorrelations were obtained among correlates of either the work participation dimension of job involvement or organizational commitment. The two highest correlations (r = .80 and r = .79) occurred between the communication climate variable and organizational commitment, respectively.

For those values above the diagonal (i.e., individuals from non-QC work groups), the lowest correlations were obtained between correlates of either job performance or the job involvement self-concept variable. The lowest correlation of .10 was between the job performance rating and communication climate. The highest correlation (r = .75) was between communication climate and both job satisfaction and group cohesiveness. The variables with the consistently highest intercorrelations were job satisfaction, the job involvement work participation scale, and participation in decision making. The pattern of intercorrelations was very similar to the pattern obtained for QC members. It is interesting to note that correlations involving job performance were very low for three

variables: job satisfaction (r = .11), organizational commitment (r = .15), and the central life interest scale of job involvement (r = .15).

To summarize, it appears that across the three groups of employees for which correlations were computed, the majority of intercorrelations involving job performance and the job involvement self-concept variable were consistently low. Surprisingly, the correlations involving organizational commitment were highest for non-QC members in work groups using QCs. The correlations involving participation in decision making were lowest for non-QC members in QC work groups. The same two variables consistently had the highest intercorrelations with other attitudinal scales: job satisfaction and the work participation measure of job involvement.

Correlations were computed for the same three groups of employees between each attitudinal variable and three outcome variables: sick leave usage, job effort rating, and intent to remain/quit. These correlations are shown in Table 10.

The same patterns of intercorrelations were evident for the outcome variables across all three groups of employees. Sick leave usage did not appear to be highly correlated with any of the attitudinal variables. For non-QC members working in non-QC departments, sick leave usage was negatively correlated with the central life interest

Table 10
Intercorrelations Between Nine Attitudinal Variables and Three Outcome Variables

Variable	QC Members			Non-Members from non-QC Work Centers			Non-Members from QC Work Centers		
	1	2	3	1	2	3	1	2	3
Job Satisfaction	-.16	.28*	.31*	-.06	.42***	.24**	-.07	.08	.46***
Job Performance	.04	.36**	.21	-.10	.51***	.15	-.04	.38**	.26*
Organizational Commitment	-.11	.31*	.41**	-.17*	.43***	.40***	-.12	.22	.61***
Job Involvement Work Participation	-.12	.38**	.27*	-.16	.40***	.23**	-.04	.19	.37**
Job Involvement Central Life Interest	.08	.23*	.44***	-.22*	.41***	.32***	.21	.26*	.37**
Job Involvement Self-Concept	-.06	.56***	.09	-.28**	.43***	.29***	-.11	.38**	.58***
Participation in Decision Making	-.02	.36**	.32*	.01	.29**	.17*	.06	.14	.37**
Group Cohesiveness	-.02	.12	-.06	.01	.21*	.22*	-.13	.21	.35*
Communication Climate	.10	.12	-.05	-.06	.26**	.13	-.11	.16	.44**

Note: Variable numbers 1, 2, and 3 refer to sick leave usage, job effort rating, and intent to remain/quit, respectively. For QC members, $48 \leq N \leq 52$; for non-members from non-QC work groups, $99 < N < 107$; for non-members from QC work groups, $41 \leq N \leq 43$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

measure of job involvement ($r = .22$; $p < .05$), with the self-concept measure of job involvement ($r = .28$; $p < .01$), and with organizational commitment ($r = .17$; $p < .05$). Job effort ratings appeared to be significantly related to most of the attitudinal variables. This correlation was highest between job effort ratings and the job involvement self-concept measure across all three employee groups (r's = .56, .43, and .38). Intent to remain/quit was positively correlated with most of the attitudinal variables. It is interesting to note, however, the correlation between intent to remain/quit and the job involvement self-concept measure. This correlation was .58 for non-QC members in work groups using QCs, .29 for non-QC members in work groups not using QCs, and only .09 for QC members themselves.

Comparison Between Group Means

Tables 11 through 14 show the results of t-tests conducted between different groups of employees. The results of these tests were used to test the hypotheses presented in Chapter II.

Table 11 provides mean difference tests between QC members and all non-members responding to the survey. Significant differences were found on four variables between QC members and non-members. Self-ratings of job performance were significantly higher for QC members than they were for non-members ($p < .01$). Self-ratings of job effort

were also significantly higher for QC members ($p < .10$). Two variables were significantly higher for non-members however: intent to remain/quit ($p < .10$) and job satisfaction ($p < .10$). Although not significant, six variables yielded higher scores for the non-QC group members than for the QC members: organizational commitment, work participation measure of job involvement, central life interest measure of job involvement, participation in decision making, communication climate, and group cohesiveness. Additionally, the amount of sick leave used by non-members was slightly lower than for QC members.

Table 12 compares variable means for employees partitioned into two groupings: employees of work groups using QCs (regardless of actual QC membership) and employees of work groups not using QCs. Self-ratings of both job performance and effort were significantly higher ($p < .05$) for employees of work groups containing Quality Circles. However, employees of work groups not containing QCs used significantly less sick leave than employees of QC work departments ($p < .10$).

Table 13 shows the results of analyses comparing QC members against non-members from the same work units. Scores on one variable were significantly higher for the QC members: self-ratings of job performance ($p < .05$). One variable was significantly lower for QC members: intent to remain/quit ($p < .10$). Scores for QC members were lower, but not significantly lower, for six other variables: job

Table 11
Mean Difference Tests Comparing
QC Members and All Non-Members

	QC Members		Non-Members		
Variable	M	SD	M	SD	t
Sick Leave	2.70	1.80	2.33	1.80	-1.26
Effort Rating	4.37	1.09	4.13	0.85	1.63*
Intent to Remain	3.67	1.35	3.97	1.23	-1.44*
Job Satisfaction	23.65	5.96	24.79	5.23	-1.31*
Job Performance	27.79	4.76	25.36	5.47	2.84**
Organizational Commitment	61.37	22.88	64.72	19.96	-0.99
Job Involvement Work Participation	24.15	8.37	25.24	7.39	-0.88
Job Involvement Central Life Interest	15.13	8.16	16.49	8.04	-1.04
Job Involvement Self-Concept	18.17	2.44	17.62	3.26	1.12
Participation in Decision Making	21.08	8.97	21.42	8.53	-0.25
Group Cohesiveness	12.87	5.73	13.51	4.97	-0.78
Communication Climate	18.79	5.81	18.90	5.75	-0.12

Note: For QC members, $49 \leq N \leq 52$; for non-members, $141 \leq N \leq 150$. All statistical tests were one-tailed tests.
* $p \leq .10$. ** $p < .01$.

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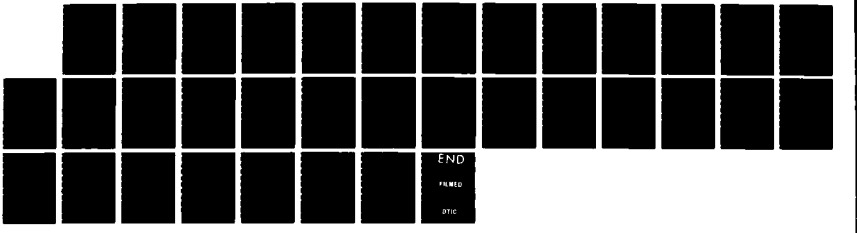

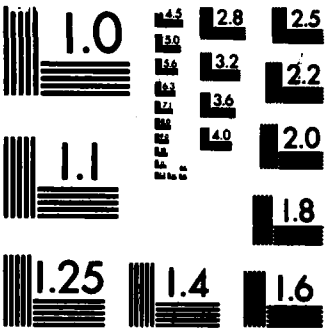

Table 12
Mean Difference Tests Comparing
All Employees of Work Groups with QCs
and All Employees of Work Groups without QCs

	Work Groups with QCs		Work Groups without QCs		
Variable	M	SD	M	SD	t
Sick Leave	2.63	1.80	2.28	1.80	-1.30*
Effort Rating	4.37	0.95	4.07	0.88	2.30**
Intent to Remain	3.94	1.19	3.87	1.32	0.37
Job Satisfaction	24.21	5.83	24.70	5.16	-0.63
Job Performance	26.87	5.58	25.39	5.20	1.93**
Organizational Commitment	63.06	21.06	64.34	20.64	-0.42
Job Involvement Work Participation	24.88	7.96	25.02	7.46	-0.13
Job Involvement Central Life Interest	15.89	8.50	16.31	7.79	-0.36
Job Involvement Self-Concept	18.10	3.01	17.53	3.11	1.28
Participation in Decision Making	20.93	9.31	21.61	8.15	-0.55
Group Cohesiveness	13.09	5.55	13.53	4.91	-0.59
Communication Climate	19.00	6.28	18.78	5.39	0.26

Note: For work groups with QCs, $77 \leq N \leq 82$; for work groups without QCs, $113 \leq N \leq 120$. All statistical tests were one-tailed tests. * $p \leq .10$. ** $p < .05$.

Table 13
Mean Difference Tests Comparing
QC Members and Non-Members in Work Groups with QCs

	QC Members		Non-Members		
Variable	M	SD	M	SD	t
Sick Leave	2.70	1.80	2.49	1.86	-0.55
Effort Rating	4.37	1.09	4.23	0.78	0.67
Intent to Remain	3.67	1.35	4.05	1.13	-1.43*
Job Satisfaction	23.65	5.96	24.33	5.68	-0.56
Job Performance	27.79	4.76	25.44	6.14	2.10**
Organizational Commitment	61.37	22.88	64.18	20.82	-0.60
Job Involvement Work Participation	24.15	8.37	24.77	7.94	-0.36
Job Involvement Central Life Interest	15.13	8.16	15.77	8.88	-0.36
Job Involvement Self-Concept	18.17	2.44	17.81	3.53	0.58
Participation in Decision Making	21.08	8.97	19.70	10.01	0.71
Group Cohesiveness	12.87	5.73	13.49	5.29	-0.55
Communication Climate	18.79	5.81	18.86	6.74	-0.05

Note: For QC members, $49 \leq N \leq 52$; for non-members, $38 \leq N \leq 43$. All statistical tests were one-tailed tests.
* $p < .10$. ** $p < .05$.

Table 14
Mean Difference Tests Comparing
QC Members and Non-Members in Work Groups without QCs

	QC Members		Non-Members		
Variable	M	SD	M	SD	t
Sick Leave	2.70	1.80	2.26	1.78	-1.42*
Effort Rating	4.37	1.09	4.08	0.87	1.76**
Intent to Remain	3.67	1.35	3.94	1.28	-1.20
Job Satisfaction	23.65	5.96	24.98	5.05	-1.46*
Job Performance	27.79	4.76	25.33	5.20	2.87**
Organizational Commitment	61.37	22.88	64.91	19.74	-0.99
Work Participation	24.15	8.37	25.43	7.19	-0.99
Central Life Interest	15.13	8.16	16.78	7.69	-1.24
Self-Concept	18.17	2.44	17.54	3.16	1.27
Participation in Decision Making	21.08	8.97	22.12	7.79	-0.75
Group Cohesiveness	12.87	5.73	13.52	4.87	-0.75
Communication Climate	18.79	5.81	18.91	5.34	-0.13

Note: For QC members, $49 \leq N \leq 52$; for non-members, $100 \leq N \leq 107$. All statistical tests were one-tailed tests.
* $p \leq .10$. ** $p < .05$.

satisfaction, organizational commitment, work participation and central life interest measures of job involvement, communication climate, and group cohesiveness.

The results shown in Table 14 are very similar to those reported in Table 11. Table 14 compared QC members to non-members of work groups lacking Quality Circles. Two variables were significantly higher for QC members: job performance ($p < .05$) and job effort ratings ($p < .05$). Job satisfaction ($p < .10$) was significantly lower for QC members, and sick leave usage was significantly higher for QC members ($p < .10$).

To summarize the results of the t-tests, trends in significant differences existed for four variables. QC members appeared to express lower intentions to remain with the Air Force during the coming year; they appeared to rate themselves higher on the amount of effort expended on the job and also on their performance on the job; and they tended to be less satisfied with their jobs. Therefore, of the hypotheses listed in Chapter II, only hypotheses 7 and 8 were supported by the results of this study; the remaining hypotheses were not supported. In addition, six variable means tended to be consistently higher, but not significantly higher, for non-QC members: sick leave usage, organizational commitment, the work participation and central life interest dimensions of job involvement, participation in decision making, and group cohesiveness.

A Posteriori Items

A posteriori items measured in the present study were related to both the Quality Circle process and to Quality Circle membership. If respondents' work groups used QCs, respondents were asked the extent of their personal involvement with QCs and whether they thought managers and supervisors of their organizations supported the QC process. QC members were questioned about their satisfaction with the QC process. Additionally, QC members were asked about the size of the circle to which they belonged and the length of their membership with a circle.

Frequency tables for the five a posteriori items are shown in Appendix B. The most noteworthy results of these tables concern QC support, satisfaction, and membership length. It appeared as though top-management support was generally lacking for the QC process. QC member satisfaction with the QC process was very low. Finally, most of the QC members responding to the survey were members of a Quality Circle for less than six months.

V. Discussion and Recommendations

Introduction

As mentioned earlier, the Department of Defense is showing an increasingly greater interest in Quality Circles as a way of better accomplishing its mission. In fact, QCs are frequently touted as the organizational intervention of the 1980s for both the private and public sector. Crawford (1980) found that annual costs of government-wide QC programs exceeded five million dollars. Federal deficits and constrained budgets make it necessary to justify these costs of implementing and maintaining QCs. To do this, Air Force and government managers need to be able to evaluate the effects of QCs.

The present study attempts to give the AF manager, particularly the civil engineering manager, a better understanding of Quality Circles and how they influence various attitudinal outcomes among civil engineering personnel. It also attempts to add to the existing literature on QCs and to stimulate further research.

Discussion

The intercorrelations between the measured attitudinal variables yielded consistent results. Two variables, job performance and the self-concept dimension of job involvement, consistently yielded lower correlations with other variables than did any other measure.

High intercorrelations consistently existed among correlates involving job satisfaction and the work participation dimension of job involvement. It appeared then that job satisfaction was highly related to scores on the other attitudinal variables.

Consistent patterns of intercorrelation also emerged for correlations involving the motivational outcomes of sick leave usage, self-rated effort, and intentions to remain. Sick leave usage was not highly correlated with any of the attitudinal variables measured for QC members. For non-QC members from non-QC work centers, sick leave was inversely correlated with organizational commitment ($p < .01$) and with two measures of job involvement: central life interest ($p < .05$) and self-concept ($p < .01$). In addition, the intercorrelations involving sick leave usage were in the opposite direction of that expected for most of the attitudinal variables. These findings contradict those of Atwater and Sander (1984). They found in their research that sick leave was highly correlated with job involvement, job satisfaction, and organizational commitment. A possible explanation may be that employees either overstated or understated their sick leave usage. While the present study used self-reported estimates of sick leave use, Atwater and Sander (1984) used actual employee records for their sick leave data.

Job effort ratings were positively correlated with all of the attitudinal variables. This correlation was strongest for the attitudinal variables of non-QC members from work groups not using QCs and weakest for non-members from work groups using Quality Circles. Correlations were consistently strong across all three groups of employees for three measures: job performance, and the job involvement scales of central life interest and self-concept.

Intentions to remain were weakly correlated with job performance, group cohesiveness, and communication climate. Intent to remain was strongly correlated across all three groups of employees with job satisfaction, organizational commitment, participation in decision making, and the work participation and central life interest measures of job involvement. Correlations for intent to remain were generally weakest for QC members.

Comparison between group means (t-tests) also yielded consistent, yet somewhat surprising, results. Self-ratings of job effort and job performance were significantly higher for QC members. However, when QC members were compared to non-members from work groups using QCs, no significant differences were found to exist between job effort ratings. Job performance differences were strongest for the comparison between QC members and non-members from work groups not using QCs. QC members may feel they are trying harder and performing better as a function of participation in the Quality Circle process. On the other hand, the significant

differences between QC and non-QC members on the demographic variables makes equally tenable the conclusion that group differences were due to group composition factors rather than involvement in Quality Circles, per se.

None of the previous studies reviewed in Chapter II used self-ratings of job effort; therefore, comparisons of this measure with past research are not possible. Self-ratings of job performance, however, were used. Steel et al. (1985) found that self-ratings of job performance did not significantly change when comparing either pre- and post-measure data on QC groups or control groups.

The job involvement self-concept scale was the only other variable which also tended to yield higher scores for QC members, but not significantly so. These higher scores were similar to those found by previous researchers.

It was hypothesized that QC members would be more satisfied with their jobs and would report higher levels of morale. The results of the present study did not support this hypothesis, however. Job satisfaction was found to be significantly lower for QC members. However, when compared to non-members from work groups with QCs, job satisfaction was still lower for QC members, but not significantly lower. Thus, it appears as though job satisfaction may be a function of the work group composition. The present study's findings on job satisfaction are very different from findings of previous studies. Steel et al. (1985) found significant differences in job satisfaction in favor of QC

members between QC groups and control groups. Griffin and Wayne (1984) also found significant differences in the expected direction between effective and less-effective Quality Circles.

QC members used slightly more sick leave than non-members. This increased use of sick leave was not significant when QC members were compared to all non-members or when compared to non-members from QC work centers. When compared to non-members from work groups not using QCs, however, QC members used significantly more sick leave than non-members. Additionally, a comparison between work groups using QCs and those not using QCs showed that employees of QC work groups used more sick leave than employees of non-QC work groups. Contrary to the results of this study, Atwater and Sander (1984) found that sick leave usage was not affected by QC participation.

Intent to remain was significantly lower for QC members than non-members. This difference was still lower but it was not significantly lower when QC members were compared to non-members from work groups not using QCs. Employees of work groups using QCs indicated slightly higher intent to remain scores than employees of work groups not using QCs.

Six attitudinal variables were consistently lower, but not significantly lower, for Quality Circle members: group cohesiveness, communication climate, participation in decision making, organizational commitment, and the job involvement measures of central life interest and work

participation. These findings appear similar to those found by Steel et al. (1985) in their study of a hospital.

Four tenable explanations for the results of this study will be discussed. The first explanation corresponds to Atwater and Sander's (1984) contention that joining or belonging to a QC is not related to job involvement but to attitudes and perceptions about the work itself. Atwater and Sander (1984) contend that blue-collar workers are more likely to join a QC if they are dissatisfied with their jobs while white-collar workers are more likely to join if they are satisfied. Respondents were not asked to state their job positions; however, civil engineering squadrons are predominantly blue-collar workers (skilled tradesmen). The results of the present study would then appear to support Atwater and Sander's (1984) theory. QC members were dissatisfied with their jobs and were seeking to change them.

Another explanation may be gained by referring to the a posteriori items discussed in Chapter IV and shown in Appendix B. Of the 52 respondents used as the sample of QC members, 25 reported being members of a Quality Circle for less than six months. Such a short time period may not have been long enough for a person to have received full benefits from the QC process. Many authors have noted that Quality Circles are not a "quick fix;" they need time to mature and bear fruit (Cole, 1980a). To support this theory, only 17 respondents reported being satisfied with the QC process. Other QC members were either dissatisfied with QCs or could

not decide. Consistent with this line of thought were the responses to the questionnaire item dealing with management support of the Quality Circle process. More than half of the respondents indicated that managers and supervisors either did not support the QC program at all or were only somewhat supportive.

These results may be further explained by comparing the differences in group composition between QC and non-QC members. Employees of work groups using Quality Circles were significantly older and had been in their organizations significantly longer than employees of work groups not using QCs. QC members were also significantly better educated and had obtained a significantly higher pay grade than non-members. It may be that older, better educated, more experienced workers are better performers than young new employees. Thus, the significant differences in self-ratings of job effort and job performance may be explained by referring to the group composition of QC and non-QC members.

Finally, the fact that the present study was a cross-sectional one precluded the establishment of any baseline measure from which to make further comparisons. QC group scores may have been significantly lower for satisfaction and intent than the scores for non-QC members, but they may have been even lower before joining a QC. If such a scenario occurred, the QC process could have been a resounding success; yet it would not be detected in the present study's design. With no means of measuring this, it is conceivable

that scores may have risen significantly for QC members while remaining constant for non-QC members. This is similar to Atwater and Sander's (1984) contention that dissatisfied blue-collar workers are more likely to join a QC. Their dissatisfaction may have been even lower than it is now.

In summary, the unexpected results of the present study may be further explained by examining the structure of the study itself. There are many inherent weaknesses in the present study that mitigate its results. The biggest weakness of the study is its cross-sectional nature across five civil engineering organizations. Any causal inferences are thus impossible. With many respondents claiming membership in a QC of less than six months, maturity may not have been achieved. The results may be further slanted because of the significant differences in demographic characteristics between QC members and non-members. There was also no control over the QC programs; results may very well be attributed to some unknown organizational situation.

Recommendations

Further research should be conducted to better evaluate the influence of Quality Circles on various attitudinal measures. If QCs are indeed the organizational intervention of the 1980s, and are to be increasingly used by the government, further research into the outcomes of the QC process are warranted. The many weaknesses inherent in the

present study should suggest that the results are tentative, at best. Civil engineering organizations may not be a suitable environment for QCs; only more and better research will tell.

APPENDIX A: Questionnaire Items

Background Information

This section of the survey contained several items dealing with personal characteristics. This information was used to obtain a picture of the background of the "typical employee."

1. Your age is:

    1. Less than 20
    2. 20 to 25
    3. 26 to 30
    4. 31 to 40
    5. 41 to 50
    6. 51 to 60
    7. More than 60

2. Your highest educational level obtained was:

    1. Non high school graduate
    2. High school graduate or GED
    3. Some college work but no degree
    4. Associate's degree or LPN
    5. Bachelor's degree or RN
    6. Some graduate work but no graduate degree
    7. Master's degree

3. Total months in this organization is:

    1. Less than 1 month
    2. 1 month or more but less then 6 months
    3. 6 months or more but less than 12 months
    4. 12 months or more but less than 18 months
    5. 18 months or more but less than 24 months
    6. 24 months or more but less than 36 months
    7. 36 months or more

4. You are a (an):

    1. Officer
    2. Enlisted
    3. Civilian (GS)
    4. Civilian (WG)
    5. Non-appropriated Fund (NAF Employee)
    6. Other

5. Your grade level is:

   1. 1-2
   2. 3-4
   3. 5-6
   4. 7-8
   5. 9-10
   6. 11-12
   7. 13-15

6. How many days of sick leave did you take in 1984?

   1. Less than 1 day
   2. 1 day or more but less than 3 days
   3. 3 days or more but less than 5 days
   4. 5 days or more but less than 7 days
   5. 7 days or more but less than 10 days
   6. 10 days or more but less than 15 days
   7. 15 days or more

Job Satisfaction

The five items below relate to the degree to which an employee is satisfied with various aspects of his or her job.

   1 = Disgusted
   2 = Unhappy
   3 = Mostly dissatisfied
   4 = Mixed (about equally satisfied and dissatisfied)
   5 = Mostly satisfied
   6 = Pleased
   7 = Delighted

7. How do you feel about your job?

8. How do you feel about the people you work with--your co-workers?

9. How do you feel about the work you do on your job--the work itself?

10. What is it like where you work--the physical surroundings, the hours, the amount of work you are asked to do?

11. How do you feel about what you have available for doing your job--I mean equipment, information, good supervision, and so on?

Self-Rated Job Performance

The following statements deal with the amount of feedback an employee receives from his or her supervisor concerning his or her performance. The employee's frame of reference should be his or her supervisor's evaluation of his or her performance in terms of formal feedback (i.e., periodic, written performance appraisals) and informal feedback (i.e., verbal communication on a day-to-day basis).

1 = Far worse
2 = Much worse
3 = Slightly worse
4 = About average
5 = Slightly better
6 = Much better
7 = Far better

12. Compared with other employees doing similar work, your supervisor considers the quantity of the work you produce to be:

13. Compared with other employees doing similar work, your supervisor considers the quality of the work you produce to be:

14. Compared with other employees doing similar work, your supervisor believes the efficiency of your use of available resources (money, materials, personnel) in producing a work product is:

15. Compared with other employees doing similar work, your supervisor considers your ability in anticipating problems and either preventing or minimizing their effects to be:

16. Compared with other employees doing similar work, your supervisor believes your adaptability/flexibility in handling high-priority work (e.g., "crash projects" and sudden schedule changes) is:

Job Effort Rating

17. Rate the typical amount of effort you normally put into doing your work.

    1 = Very little effort
    2 = Enough effort to get by
    3 = Moderate effort
    4 = More effort than most
    5 = Very much effort

Intent to Remain/Quit

18. Within the coming year, if I have my own way:

    1 = I definitely will not remain with the Air Force (civil service).
    2 = I probably will not remain with the Air Force (civil service).
    3 = I have not decided whether I will remain with the Air Force (civil service).
    4 = I probably will remain with the Air Force (civil service).
    5 = I definitely will remain with the Air Force (civil service).

Organizational Commitment

Listed below are a series of statements that represent possible feelings that individuals might have about the organization for which they work.

    1 = Strongly disagree
    2 = Moderately disagree
    3 = Slightly disagree
    4 = Neither agree nor disagree
    5 = Slightly agree
    6 = Moderately agree
    7 = Strongly agree

19. I am willing to put in a great deal of effort beyond that normally expected in order to help this organization be successful.

20. I talk up this organization to my friends as a great organization to work for.

21. I feel very little loyalty to this organization. (R)

22. I would accept almost any type job assignment in order to keep working for this organization. (R)

23. I find that my values and the organization's values are very similar.

24. I am proud to tell others that I am part of this organization.

25. I could just as well be working for a different organizations long as the type of work was similar. (R)

26. This organization really inspires the very best in me in the way of job performance.

27. It would take very little change in my present circumstances to cause me to leave this organization. (R)

28. I am extremely glad that I chose this organization to work for over others I was considering at the time I joined.

29. There's not too much to be gained by sticking with this organization indefinitely. (R)

30. Often, I find it difficult to agree with this organization's policies on important matters relating to its employees. (R)

31. I really care about the fate of this organization.

32. For me this is the best of all possible organizations for which to work.

33. Deciding to work for this organization was a definite mistake on my part. (R)

Job Involvement

The 15 statements below relate to an employee's feelings about his or her present job or work. Items 34 to 38 measured the work participation scale, items 39 to 43 measured the central life interest scale, and items 45 to 47 measured the self-concept scale. Items 44 and 48 were not used.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither disagree nor agree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

34. I often have to use the skills I have learned for my job.

35. I often have a chance to try out my own ideas.

36. I often have a chance to do things my own way.

37. I often have a chance to do the kinds of things that I am best at.

38. I often feel at the end of the day that I've accomplished something.

39. The most important things that happen to me involve my work.

40. The most important things I do involve my work.

41. The major satisfaction in my life comes from my job.

42. The activities which give me the greatest pleasure and personal satisfaction involve my job.

43. I live, eat, and breathe my job.

44. I would rather get a job promotion than be a more important member of my club, church, or lodge.

45. How well I perform on my job is extremely important to me.

46. I feel badly if I don't perform well on my job.

47. I am very personally involved in my work.

48. I avoid taking on extra duties and responsibilities.

Work Role Attitudes

This section of the questionnaire contained a number of statements that relate to feelings about an employee's work group, the demands of his or her job, and the supervision he or she receives. Items 49 to 53 measured the participation in decision making variable, items 54 to 56 measured the group cohesiveness variable, and items 57 to 60 measured the communication climate variable.

49. Within my work group, the people most affected by decisions frequently participate in making the decisions.

50. In my work group, there is a great deal of opportunity to be involved in resolving problems which affect the group.

51. I am allowed to participate in decisions regarding my job.

52. I am allowed a significant degree of influence in decisions regarding my work.

53. My supervisor usually asks for my opinions and thoughts in decisions affecting my work.

54. There is a high spirit of teamwork among my co-workers.

55. Members of my work group take a personal interest in one another.

56. If I had a chance to do the same kind of work for the same pay in another work group, I would still stay here in this work group.

57. My organization provides all the necessary information for me to do my job effectively.

58. My work group is usually aware of important events and situations.

59. The people I work with make my job easier by sharing their ideas and opinions with me.

60. People in my work group are never afraid to speak their minds about issues and problems that affect them.

If an employee's work group contained Quality Circles, he or she was asked to respond to the following two questions.

61. What is the extent of your personal involvement in the quality circle process in your work group?

1 = I was never a quality circle member
2 = I was but am no longer a quality circle member
3 = I am a quality circle member
4 = I don't know

62. Do the managers and supervisors in your organization support the quality circle process?

1 = Not at all
2 = Are somewhat supportive
3 = Are very supportive
4 = I don't know

If an employee is or had ever been a member of a Quality Circle, he or she was asked to respond to the following three questions.

63. How satisfied are you with the quality circles process?

1 = Very dissatisfied
2 = Dissatisfied
3 = Can't decide
4 = Satisfied
5 = Very satisfied

64. What is the size of the quality circle in your work group?

1 = 1 to 4 people
2 = 5 to 8 people
3 = 9 to 12 people
4 = 13 to 16 people
5 = More than 16 people
6 = I don't know

65. How long to the nearest month have you been a member of a quality circle?

1 = Less than 3 months
2 = 3 to 6 months
3 = 7 to 12 months
4 = 13 to 18 months
5 = 19 to 24 months
6 = More than 24 months

APPENDIX B: Frequencies for A Posteriori Items

Item 61: Extent of QC Involvement

Code	Absolute Frequency	Relative Frequency (Pct)	Cumulative Frequency (Pct)
1.	34	41.5	41.5
2.	14	17.1	58.5
3.	18	22.0	80.5
4.	16	19.5	100.0

Mean = 2.195 Standard Deviation = 1.180

Item 62: QC Support from Management

Code	Absolute Frequency	Relative Frequency (Pct)	Cumulative Frequency (Pct)
1.	16	19.8	19.8
2.	28	34.6	54.3
3.	16	19.8	74.1
4.	21	25.9	100.0

Mean = 2.519 Standard Deviation = 1.085

Item 63: Members' Satisfaction with the QC Process

Code	Absolute Frequency	Relative Frequency (Pct)	Cumulative Frequency (Pct)
1.	6	10.9	10.9
2.	15	27.3	38.2
3.	17	30.9	69.1
4.	13	23.6	92.7
5.	4	7.3	100.0

Mean = 2.891 Standard Deviation = 1.117

Item 64: Size of QCs

Code	Absolute Frequency	Relative Frequency (Pct)	Cumulative Frequency (Pct)
1.	2	3.8	3.8
2.	25	47.2	50.9
3.	13	24.5	75.5
4.	1	1.9	77.4
5.	3	5.7	83.0
6.	9	17.0	100.0

Mean = 3.094 Standard Deviation = 1.560

Item 65: Length of QC Membership

Code	Absolute Frequency	Relative Frequency (Pct)	Cumulative Frequency (Pct)
1.	13	25.0	25.0
2.	12	23.1	48.1
3.	12	23.1	71.2
4.	7	13.5	84.6
5.	2	3.8	88.5
6.	6	11.5	100.0

Mean = 2.827 Standard Deviation = 1.605

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VITA

Lieutenant Alfred E. Thal, Jr. was born July 29, 1958, in Altus, Oklahoma. He graduated from high school in Burkburnett, Texas, in 1976 and attended Texas Tech University from which he received a Bachelor of Science degree in civil engineering in 1981. He is an Engineer-In-Training (EIT) in the State of Texas. He was a distinguished graduate from Officer Training School (OTS) in April 1982. His first assignment was at Sheppard AFB, Texas, where his duty assignments included six months in the Contract Management section and 18 months in the Engineering Design section. Lt Thal was selected for the Graduate Engineering Management (GEM) program at the Air Force Institute of Technology (AFIT) in 1984. Upon graduation from AFIT, Lt Thal will be assigned as Chief of Resources and Requirements, 2854 Civil Engineering Squadron, Tinker AFB, Texas.

Permanent address: c/o Phyllis Thayer
1717 Midwestern Parkway #226
Wichita Falls, Texas 76308

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

AD-A161152

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION: UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT: Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S): AFIT/GEM/LSB/85S-21	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION: School of Systems and Logistics; 6b. OFFICE SYMBOL (If applicable): AFIT/LSM	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State and ZIP Code): Air Force Institute of Technology, Wright-Patterson AFB, Ohio 45433	7b. ADDRESS (City, State and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION; 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State and ZIP Code)	10. SOURCE OF FUNDING NOS. — PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT NO.
11. TITLE (Include Security Classification): See Box 19	
12. PERSONAL AUTHOR(S): Alfred E. Thal, Jr., M.S., 1Lt, USAF	
13a. TYPE OF REPORT: MS Thesis; 13b. TIME COVERED: FROM _____ TO _____; 14. DATE OF REPORT (Yr., Mo., Day): 1985 September; 15. PAGE COUNT: 128	
16. SUPPLEMENTARY NOTATION	
17. COSATI CODES — FIELD / GROUP / SUB. GR.	18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number): Quality Circles, Participative Management, Civil Engineering, Satisfaction/Morale Levels

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Title: THE INFLUENCE OF QUALITY CIRCLES ON ~~VARIOUS~~ ATTITUDINAL OUTCOMES AMONG CIVIL ENGINEERING PERSONNEL

Thesis Advisor: Dr. Robert P. Steel
Associate Professor of Organizational Behavior

Approved for public release: IAW AFR 190-1.
LYNN E. WOLAVER
Dean for Research and Professional Development
Air Force Institute of Technology (AU)
Wright-Patterson AFB OH 45433

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT: UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION: UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL: Dr. Robert P. Steel, GM-13	22b. TELEPHONE NUMBER (Include Area Code): 513-255-4549; 22c. OFFICE SYMBOL: AFIT/LSB

DD FORM 1473, 83 APR — EDITION OF 1 JAN 73 IS OBSOLETE.

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SECURITY CLASSIFICATION OF THIS PAGE

With the federal budget continually attracting attention and the social values of its members constantly changing, the Department of Defense is showing greater interest in Quality Circles (QCs) as a way of better accomplishing its mission. Costs of government-wide QC programs have exceeded five million dollars however. Therefore, Air Force managers need to be able to evaluate the effects of QCs in order to justify these costs.

This ~~research~~ thesis investigated the influence of QCs on various satisfaction levels among Air Force civil engineering personnel with the objective being to determine whether a relationship exists between QC membership and an employee's level of satisfaction/morale. Surveys were mailed to a sample of QC members and non-members working in civil engineering squadrons at five different bases. Statistical analysis consisted of reliability estimation, Pearson correlation, and Student's t-tests.

The results of this research indicated that there were significant differences between QC members and non-members on two variables: self-ratings of both job performance and job effort. In fact, it appeared that QC members scored lower, but not significantly lower, on many of the variables.

The many weaknesses inherent in this study,s design suggest that these results are tentative, at best. Four tenable explanations for the results are given. If QCs are to be increasingly used by the government, further research into the outcomes of the QC process are warranted.

U.S.Government Printing Office: 1985 - 646-047/20334

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12-85

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